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# A TACHISTOSCOPIC STUDY OF THE ORDER OF EMERGENCE IN THE PROCESS OF PERCEPTION

## CHAPTER I

### INTRODUCTION

#### PERCEPTION: FOCUS OF NEW HORIZONS IN PSYCHOLOGY

IS THERE anything unique in perception that has not already been said?

The historical trends in perceptual theory would support the probability that an area so rich in experimental methodology and factual yields has not yet been exhausted. Wever (194) once committed himself to the observation that new points of view have arisen more frequently in perception than in any other area of psychology; and certainly there is more than sufficient evidence that nowhere else has progress in psychology, for the last half-century, been as phenomenal nor as extensive in its promise of eventual application.

Indeed, the tones of contemporary experimentation and theory in perception strongly suggest that the pace for all of psychology may be evolving in the developments that are taking place here. Bartlett (3), in an extraordinarily revealing series of experiments on perceptual phenomena, insists that his most impressive conclusion is the exposure of the involved complexity of most of perceiving. Although the final and best known report of his work appears in his book *Remembering*, the title belies the extent of his contributions. As a matter of fact, the curiosity which became his original incentive arose in the course of some demonstration in perception, and he relates of the experience that "... it very speedily became evident that an examination of normal perceptual process leads directly and inevitably to an

investigation of related mental processes . . ." (3, v). The fact of the phenomenal continuum of all mental functions reverberates throughout the accounts of his studies on perceiving, recognizing, and remembering.

Vernon (99, 5-6), in agreement on the manifold implications involved in perceptual activity, finds at least three phases beyond the sensory excitation which are essential to completion of the total process:

- (a) a constructional process wherein the sensory qualities are suitably weighted and combined, each in its appropriate degree of importance, into a more or less clearly differentiated formal structure;
- (2) an assimilative process whereby the present percept is related to the body of past experience—compared, accepted, or rejected—and is then referred back to some part of the external environment from which it is assumed to have originated;
- (3) a response tendency, indicating the observer's reaction, overt or implicit, to the full implications of the percept.

There are evidences repeatedly in Bartlett's data of this tendency of the organism, early and actively, to acquire the capacity to manipulate the stimulations provided by the environment. Bartlett employs a pictorial description in which the human organism, faced with the necessity to attain a working relationship between himself and the world, appears in need of modes of escape from the dominance of the immediate environment. Alleviations from this pressure of the present are partially

satisfied by the specialization of the sense departments and by the development of fixed habits, of lowered thresholds, and of conditioned reflexes. But the *en masse* operation of the past inherent in all of these phenomena would confine the organism to an unselective sequence of influence were it not possible, somehow, that man could learn to break up the chronological order and superimpose his own arrangement of events.

To ascertain *how* the order is rearranged is the heart of the present experimental investigation. Sufficient at this point is the fact that selectivity is consistently demonstrated. Relatively constant sensory patterns prove capable of exciting a wide and varied range of responses in the same individual at different times and in different individuals at the same time. Indeed, most fundamental of the results accruing from Bartlett's experimental program are the evidences that even the process of perception, originating in an initial sensory experience, takes on a direction independent of the stimulating sensory situation:

In perceiving there is always direction of attention upon an actually present object. It is always the object or some part of it that is known, but it is known, not in a literal sense immediately, but by means of present sensuous experience of some sort. Even in the simplest act of perceiving this sensuous experience is not treated as complete in itself, but as referring to "something" which in later development gains for us all the marks of object. In his description or representation of a given object however a subject, even from very early stages, frequently passes beyond what present sensuous experience justifies, and brings in characteristics which a more careful observation will show him do not belong to the object presented (2, 225).

In no event, therefore, is perception a passive reception; "... there is always

some discrimination and selection" (2, 261). To be sure, the resultant perceptual experience may appear a completely unitary performance, but the unity is only achieved after organizing forces have elevated some details to dominance and depressed others to submission. This fact is foundational to all other considerations of phenomenal experience with which Bartlett deals.

There is an approximation in these trends of the concurrent developments characteristic of the total of scientific thinking, and this, without doubt, is one of the most significant things to emerge in contemporary treatment of perception. The totality of sciences—dedicated to the goal of organizing and systematizing the knowledge of natural events, to the end that prediction and control may be possible—has gradually, but nonetheless consistently, converged toward the single problem of explaining the order and regularity of the natural world. For it is only out of order that lawfulness emerges, and eventually only in similarities that significance resides. This, then, has meant that the problem of psychology—and the problems of each of its areas, including perception—is the problem common to all the disciplines. And contemporary theory, in appraising the organized nature of perception in terms of molar and field concepts, has brought all of psychology into the closest alliance with biological and physical thinking yet witnessed in the course of its history.

The sequence culminating in this contemporary approach reflects not so much a change of problem as a reorientation toward its solution. It is not, of course, the function of the present study to review critically the historical viewpoints which have preceded,<sup>1</sup> but it is still of

<sup>1</sup> There are a number of adequate summaries of the historical points of view. Particularly sug-

some value to be aware how their simplified and elemental views of the coherency of perceptual experience were forced to yield to a comprehensive and dynamic interpretation.

Of some importance historically was the theory of vitalism, borrowed from Dreisch<sup>2</sup> and biological literature. This, however, was comparatively short-lived, for the convenience of an abstract force was not sufficient to withstand its obvious lack of explanation. As Wertheimer (18, 7) aptly commented sometime later, vitalism failed, first of all, because it neglected to inquire whether the bases of order might not already reside among physical events themselves.

More formidable and more tenacious than this were nativism and empiricism, focal points, according to Boring (5, 221), of a "long and barren controversy." Nativism contended that the capacity of the mind to comprehend relationships existent in space is a function of the primary endowment of the organism, independent of particular experience, and hence is a product of pre-established neuro-muscular mechanisms. This does not, however, imply an elaborate physical arrangement. On the contrary, according to Koffka (55, 54), these nervous processes in traditional theory were events of a single kind only,

... excitations, starting somewhere, traveling along a nerve, being transmitted to another nerve, from that to a third, until finally they gave rise to a muscle contraction or a gland secretion. The enormous complexity of behaviour was not explained by an equal complexity of the processes as such, but only by the combination of a host of separate processes, all of the same general kind but occurring in different places. The *locus* of an ex-

citation became the most important aspect of it; diversity of process was introduced merely to account for the different sense modalities and qualities, the first coupled with a local difference, the second not. Sound stimuli would produce excitations of fibres in the acoustic nerve which would be transmitted to the temporal part of the cortex and excite the ganglion cells there to their specific forms of response, corresponding to the attributes of tone sensations.

Fixed connections, therefore, were assumed between given cortical cells and the cells of the initial sense surface. We shall be reminded later of the naivete of such an assumption in the light of the neuro-muscular role assigned in present theory.

Empiricism, on the other hand, denying any pre-established relationships, credited to learning, through experience, the development of connective patterns in perception. Boring holds philosophy responsible for the advent of empiricism into perceptual theory. Certainly the senses suggested a logical avenue for the acquisition of knowledge; and since the senses alone could not account for more than a quantitative sum of sensations, experience was necessary to describe the qualitative transformation of sensory data into perceptual events. It was thus that the acquisitions of learning, accumulated in the course of experience and eventually stabilized, were assumed to be executant toward all new and elementary sensations.

It was the rigid specificity of nativism and empiricism that made them most inadequate for the facts of perception. Here each stimulus was important and separate; to each stimulus there corresponded a single, unalterable sensation; and each perception represented no more than a mosaic of nervous excitations which duplicated in extension corresponding points on the retinae and

gested for their evaluation are those by Boring (5), Katona (52), Koffka (54), and Rogers (88).  
<sup>2</sup> Cf. Chapter II, p. 38.



stimulus points in space.<sup>3</sup>

These so-called "constancies" gave rise to a congregation of analytical units. Thus, in Wundtian "mental chemistry" are to be found references to elementary sensations, with their attributes of quality and intensity, and to perception as complexes of sensations that may be temporal, spatial, or intensive, ". . . fixing upon psychology for a long time the notion of the synthesis of elements into complexes" (5, 3). But elements must be bound, somehow, to form compound relationships; and it was here that fusion, assimilation, complication, attention, association, attitude, creative synthesis, and form quality variously arose as coordinating factors. Actually, according to Wertheimer (18, 13),

It is on principle quite arbitrary *what* is coupled in simultaneity and succession. For the togetherness itself the content or the relation of contents is really irrelevant. No intrinsic moments determine the aggregation; there are instead such foreign, extrinsic factors as frequency or simultaneity of presentation (of the constituents), and so on.

From the and-summation of sensations is thus derived the perceptual product, fundamentally static in nature inasmuch as both the mediating visual cortex and the perceptual event are ". . . purely geometrical, each point having its own 'local sign,' while the appearance of a surface is held equivalent to the sum of specially distributed local signs" (55, 117).

By what lines of evidence has contemporary theory effected a break from these earlier forms of thinking? Most conspicuous of all the refutations of the

tradition have been the experimental offerings of the Gestalt psychologists. Even a few from their wealth of illustrations will establish the direction of their position.

They have scored repeatedly against the assumption of corresponding stimulus identity. Vernon (99, 4) submits that very little, actually, is known about the sensory stage. Adrian and Matthews, for example, have shown that there is remarkably little separation in the qualities of sensation which exist in the discharge along the sensory nerves. "Thus we may infer that only a gross difference as regards intensity, extensity and duration exists outside the cerebral cortex of the central nervous system" (99, 5). Parsons (73, 42-3) suggests that even initial receptions may already have been altered:

Perception, or the act of perceiving, consists in the integrating of receipts, which may themselves have undergone differentiation and segregation of the differentiated products, resulting in the emergence of a percept. This process of differentiation, segregation, and integration, to which I have applied the term apocritic principle, occurs frequently in the evolution of higher modes of consciousness. The psychological unit is the percept which can be analyzed into constituent "sensations" only by a process of abstraction. An isolated sensation is never experienced.

Koffka (55, 77-8) distinguishes between "real" and "apparent" stimuli, "geographical" and "behavioral" environment, and concludes that the existence of one is "neither the necessary nor the sufficient cause" for the other:

If we choose size as the aspect in which we should find correspondence we see at once that no direct relation between real and apparent size can exist, for the moon looks large on the horizon and small on the zenith. And even for the aspect of motion it is easy to prove that the existence, within the field

<sup>3</sup>Various terms have been applied to this point-to-point correspondence assumed between the stimulus and ensuing perception. Thus, "mosaic hypothesis," "constancy hypothesis," and "bundle hypothesis" all have similar connotations in empirical discussions.

of vision, of real motion is neither a necessary nor a sufficient condition for the perception of motion.

Boring (5, 245) points out that even if perception came near to matching the stimulus, it may not match the retinal image. How else can we refer to the fact that perception puts back the third dimension of the stimulus that was lost in the bi-dimensional retinal image?

Again, the Gestalt experimentalists have broken the defense for experiential determinism, when frequency and association have sufficed as explanatory principles. Gottschaldt (18, 11) maintains that if experience determines perception, then the more often a specific figure has been presented, the easier it should be to distinguish this figure when it appears in a larger one. But experimental evidence does not verify this. Gotz (55, 88-9) has proved that chicks only three months in age show sufficient size constancy to select as larger feed grains whose retinal image is only 1/30th that of the competing grains; and, as Koffka (55, 88-9) wittingly concludes, "Chicks must be geniuses if they can discover in the first three months of their lives that something that looks smaller is really bigger." Koffka (55, 209-10) denies that the articulation of the field of vision into figure and ground could depend entirely upon learning and experience, since

... originally the chances were even *which* side of the contours would have the segregating functions, whether holes or things would be seen. ... The first claim, equal chance for hole and things, is in strict contradiction to the laws of figure-ground articulation which we have derived from empirical evidence. Were it true, then patterns for which we had no experience should be absolutely ambiguous with regard to the figure-ground articulation. And this deduction contradicts experimental evidence. And the second claim

of the empiricist, that experience turns the scales in favor of one of several possible figure-ground organizations, lacks any kind of substantiation. Neither do we know what kind of experiences are to have this effect, nor how they are to bring it about.

Koffka (55, 95), once more, finding definite quantitative dependencies of size constancy upon the distance and elevation, challenges the experience theorist to prove that number of experiences is equivalent to amount of constancy found experimentally, *i.e.*, the less constancy, the less experience. Witness the tilted telegraph poles and houses as one looks out of the train window while ascending a hill (55, 224). Koffka (55, 103) indicates that the experience hypothesis, by definition, is completely incapable of verification. Since the *sum* of present sensations is not equal to *objects* in the environment, the images of past experience must be currently aroused; and in order that these contribute to our knowledge of the present stimulus, both images and present sensations must fuse indistinguishably. Hence primarily aroused sensations, reproduced images, and the process of fusion, by their very nature, defy analysis or demonstration. Koffka (55, 76-7) replies to his own question, "Why, then, do things look as they do?" that the natural answer, "Things look as they look because they are what they are" is not only inadequate but often completely false. To wit, Wertheimer's (18, 86) instance of the case for right angles:

Right angles surround us from childhood (table, cupboard, window, corners of rooms, houses). At first this seems quite self-evident. ... Is it *true* that cupboard, tables, etc., actually present right angles to the child's eye? If we consider the literal reception of stimuli upon the retina, how often are *right angles* as such involved? Certainly less often than the *perception* of right angles. As a matter of fact the conditions necessary for a



literal "right angle" stimulation are realized but rarely in everyday life (*viz.* only when the table or other object appears in a frontal parallel plane.) Hence the argument from experience is referring not to repetition of literal stimulus conditions but to repetition of phenomenal experience—and the problem therefore simply repeats itself.

Finally, the Gestaltists have made their most impressive attacks on the premise that the mechanisms of the older approaches overlook the dynamic forces which are everywhere in evidence in perceptual experiences. How else is organization achieved among parts? Koffka (55, 97-8) shrewdly points out that there is nothing in the nature of proximity that explains why the stimuli at two adjacent points on the retina should make the two corresponding points in behavioral space belong either to two separate objects or to one and the same object. Further:

If an object in the behavioural field is a thing by itself, it must be an integrated whole separated or segregated from the rest of the field. The stimuli as a pure mosaic possess neither this integration nor this segregation. . . . If we speak of pictures or images as stimuli we mistake the result of organization for the cause of organization, a mistake that is being committed again and again.

Köhler (18, 64-5) insists it is not possible that the number of stationary connections necessary to account for all co-ordinated behavior should appear fixed within the organism. He postulates, instead, inner forces directed toward equilibrium of the total system, in which there is relatively little possibility that parts of the whole could become self-sufficient. And when independent parts are eliminated, so are the haphazard results which follow such aggregations:

In the first case (independent forces) only a mechanistic theory of external connections can account for order; in the second it is obvious that a distinct direction of the whole

happening is necessarily maintained, and this for the self-contained, functional system as a whole. This is true insofar as spatial, functional, and other displacements in the system mutually determine one another so that a steady state of the whole system, under the given conditions, is approached. . . . Yet all internally coherent systems in the inorganic world behave in this way; the arrangement of internal forces is always directed towards balance throughout (18, 64-5).

The abandonment of the constancy hypothesis does not mean that we put in its place an arbitrary connection between proximal stimulation and the looks of things. All we intend to do is to replace laws of local correspondence, laws of machine effects, by laws of a much more comprehensive correspondence between the total perceptual field and the total stimulation, and we shall, in the search for these laws, find at least indications of some more specific constancies, though never one of the type expressed by the constancy hypothesis (55, 96).

How, then, does the area of perception encourage another study? We only review conclusions already implied:

- (1) that the most significant psychological progress in the past, and the most optimistic promise for the future, appear localized here;
- (2) that the experimental and theoretical trends in perception, because they have converted perceptual descriptions from reproductive to constructive acts, point up the rich and complex storehouse of exploration available for any phase of behavior dependent upon the modes of organization of the operating organism;
- (3) that the remarkable reorientation of perception in terms of the Gestalt viewpoint reflects the closest approximation in the history of psychology to the theoretical and experimental approaches concurrently developing in the biological and physical sciences.

#### IMPETUS FOR THE PRESENT STUDY

#### *Non-Directive Therapy*

The preliminary interest which led to

this study originated in an increasing dissatisfaction with the philosophy and application of so-called "non-directive" therapy in the Psychological Clinic. It is not, however, the intent to attempt here either a critical or a comprehensive evaluation of this form of therapy. The fundamental problem in which the study ultimately became rooted is basic to the theoretical structure of all psychological treatment, and any one form of therapy can rightfully be isolated for attack only as it is understood to represent a general experimental and interpretative inadequacy in clinical procedures. It is solely for the purpose of establishing a frame of reference, therefore, that citations are offered exclusively from non-directive material.

Rogers (89, 28-9, 217-8), in defining the concepts upon which nondirective therapy operates, postulates that the product of successful therapy is the increased ability of the client to attack and to solve by himself his future problems:

This newer approach differs from the older one in that it has a genuinely different goal. It aims directly toward the greater independence and integration of the individual rather than hoping that such results will accrue if the counselor assists in solving the problem. . . . The aim is not to solve one particular problem, but to assist the individual to *grow*, so that he can cope with the present problem and with later problems in a better-integrated fashion. If he can gain enough integration to handle one problem in more independent, more responsible, less confused, better-organized ways, then he will also handle new problems in that manner.

Again:

It should be pointed out that in the client-centered type of therapy . . . there is no attempt to solve the client's problems through re-education. It is not expected that his problems will all be solved through counseling, nor is this assumed to be a desirable goal. Satisfying living consists, not in a life without

problems, but in life with a unified purpose and a basic self-confidence which gives satisfaction in the continual attack upon problems. It is this unified purpose, this courage to meet life and the obstacles which it presents, that is gained through therapy. Consequently, the client takes from his counseling contacts, not necessarily a neat solution for each of his problems, but the ability to meet his problems in a constructive way. It follows that re-education is not, as has been sometimes supposed, the retraining of the individual in all aspects of life. It is rather a sufficient practice in the application of the new insights to build up the client's confidence and enable him to carry on in healthy fashion without the support of the counseling relationship.

These are eloquent and challenging goals. Perhaps no prior description of therapeutic aim or technique affirmed more clearly a fundamental respect for the self-dignity of the clinical patient, or asserted more positively a faith in the self-contained capacity of that client for psychological recuperation and subsequent development. It is probable that not a little of the aura which has attended the extension of nondirective practice has been nourished by the appeals of its characteristic warmth and responsiveness, its permissive freedom, its predominant concern for the client, and its lack of pressure or coercion (89, 87-90). Surprising, instead, if they did not bring relief from the dogmas of more directive and Freudian types of treatment!

But does non-directive technique achieve its therapeutic goals? One might expect that such auspicious emphasis on growth toward independent behavior would inevitably stem from—or lead immediately to—some methodology designed to promote such results, since it is the *process*, and not the specific resolution which the client must acquire during therapy if the results claimed

for non-directive therapy are to be substantiated. Yet, straightway, Rogers evades the process in favor of the end objective, by identifying the counseling goal as insight and self-understanding, described as "bubbling through spontaneously" (89, 40). And numerous further references elaborate the supposed immediacy with which this insight becomes observable:

The primary technique is to encourage the expression of attitudes and feelings. . . until insightful understanding appears spontaneously (89, 195).

It will be noted that although other techniques are evident in the case of Barbara, . . . the most profound and helpful insights, the understandings which are most effective for reorganization, are those which she expresses spontaneously (89, 195).

Insight and self-understanding are most effective when they arise spontaneously. If the counselor has been successful in freeing the client to look clearly at himself and his problems, the most valuable type of insight will develop on the client's own initiative (89, 204).

It is then evident that the spontaneous development of these new perceptions is likely to be the most rapid road to insight (89, 208).

The precise nature of this insightful understanding is not altogether clear in Rogers' delineation, but he appears to catalogue it as largely perceptual in constitution:

For the present it may be adequate to say that the term [insight] implies the perception of new meaning in the individual's own experience. To see new relationships of cause and effect, to gain new understanding of the meaning which behavior symptoms have had, to understand the patterning of one's behavior—such learnings constitute insight (89, 174).

. . . [Insight] involves the reorganization of the perceptual field. It consists in seeing new

relationships. It is the integration of accumulated experience. It signifies a reorientation of the self. All these statements would seem to be true. All lay sound emphasis upon the fact that insight is essentially a new way of perceiving (89, 206-7).

And, in conspicuous contradiction to the earlier "spontaneity" principle:

Insight comes gradually, bit by bit, as the individual develops sufficient psychological strength to endure new perceptions (89, 177).

This is a difficult process to discuss effectively, largely because it is a piece-meal affair, rarely if ever accruing all at once (89, 174).

What Rogers implies by perceptual processes should suggest the course of the technique necessary in therapy for promoting the development of insights. The perceptions with which he specifically deals he segregates into three types:

(1) the perception of relationships (89, 207-8)—the perception of the related nature of previously known facts.

Evidently this type of perception is possible in counseling and therapy only when the individual is freed from defensiveness through the process of catharsis. . . .

Why is it that we cannot save time by telling the client these relationships, . . . ? . . . The usual answer is that emotional as well as intellectual acceptance is needed. Precisely what this means from a psychological point of view is not as yet entirely clear.

(2) the acceptance of self (89, 208)—the perception of the related nature of all impulses.

(3) the positive choice of more satisfying goals (89, 208, 210)—

It is the fact that the counseling relationship is a releasing, non-threatening relationship which makes it possible for him to consider his choices with greater objectivity and select those which offer the deepest satisfaction. It is here that the therapist finds himself in league with powerful forces—biological and social—which tend to make growth and adulthood a rewarding type of satisfaction. . . .



An understanding of this third element of self-understanding will add finality to the conclusion that insight must be earned and achieved by the client, and cannot be given to him by educative means or by a directive type of approach. . . . If the counselor fully recognizes this limitation and can stand by with an understanding attitude, clarifying the issues, but making no effort to influence the choice, he thereby greatly increases the probability that the choice will be constructive, and that positive actions will be taken to put this constructive choice into effect.

It is at this point that the writer has felt persistent unwillingness to accept without more evidence and clarification. Shall we continue to employ psychological verbiage to obscure our evident ignorance of the processes which bring our results in the clinic? Shall we be satisfied merely to "stand by with an understanding attitude" while the client experiences the struggle toward reorganization? Does our "understanding" include the nature of the struggle, as well, or only the fact of its duration? Can we subscribe to the assumption of natural forces at work in the client without checking the order of their operation? By what justification can Rogers (89, 42) state that "once insight is achieved the actions that are taken are likely to be admirably suited to the new insight?" Could the counselor, if he actually understood the mechanisms of the process, safely become more instrumental in the reorganizational activity than the non-directive therapist does? What are the forms of perceptual experiences to which the client is subject in his struggle? Will the struggle, self-stimulated and self-sustained—and this, it is to be remembered, is basic to non-directive procedure—naturally tend toward maximal and positive directions, as Rogers suggests?<sup>4</sup> And knowing the answers to

these, could we realize new educational and clinical implications in the problems of psychological development?

It is our contention that therapy is more than release, and that the therapeutic process is not successfully completed unless constructive activity is subsequent to catharsis.<sup>5</sup> It is our contention, too, that Rogers seriously confuses the distinctions between growth and development; that psychological *development*, unlike Topsy left to *grow*, has no more natural assurances of maximal attainment than any other form of organic *progression* unassisted by adequate and facilitating factors.<sup>6</sup> And we question that there is anything more than wishful thinking in the non-directive assumption that the client gains a new *modus operandi*.<sup>7</sup> Quite to the contrary, experiences

drive toward health, growth, and adjustment: "Therapy is not a matter of doing something to the individual, or of inducing him to do something for himself. It is instead a matter of freeing him for normal growth and development, of removing obstacles so that he can again move forward."

<sup>5</sup> Rogers (89, 172), in defense of even short-term counseling, contends that if the process goes no further than the cathartic level, "it is helpful and constructive. . . . The client is now more competent to meet his situation than the client who leaves the interview with much half-digested advice."

<sup>6</sup> Biological writers go to considerable pains to distinguish between "growth" and "development," regardless of the specific connotations attributed to the two terms. Weiss (106, 1-14) has restricted the use of the term "growth" to enlargement of mass; the most adequate criterion of development so far he has accepted as *progressiveness*, implying changes which show permanent residues of a cumulative sort. Child (10, 716, 1) has qualified growth as including both increment and decrement of substance; development he has referred to as a continuous series of events in space and time. Certainly the terms are not mutually exclusive, but neither are they mutually cooperative. As Child (10, 718) states: "Growth patterns are evidently related in some way to the gradient patterns of development, but the relation is not necessarily direct and simple."

<sup>7</sup> Rogers (89, 165, 208) virtually admits himself that he has nothing new to offer in methodology which the *client* can adopt: "Are there any devices which can be used to accelerate therapy

<sup>4</sup> There is a significantly passive attitude in Rogers' (89, 29) acceptance of the individual

in the psychological laboratory verify the remarkable tenacity of the organism's customary patterns of behavior unless the advantage in sacrificing them is made forcibly stronger than their retention warrants.<sup>8</sup>

### *Rorschach Method*

Practice in the clinical use of the Rorschach ink-blot method<sup>9</sup> has led to a second point of mounting curiosity. In fact, the growing credence in clinical circles for the application of a range of projective techniques—of which, without doubt, the Rorschach is currently the most popular—has raised any number of questions about the psychological processes involved by which relatively limited situations and materials can expose total personality configurations (40, 531). Experience with the Rorschach inevitably culminates in illustrations of astonishingly accurate and helpful personality diagnosis; but these are instances of operational results, with very little hint of their process.

The complete theoretical underpinnings of projection, as a clinical procedure, are still somewhat obscure, but the basic concept of this class of instru-

or to insure more adequate facing of real problems? It would seem to the writer that there are relatively few such devices as yet." Again, "... there are many unanswered questions here, and experimental investigations of changes in self-perception, in the field of emotionalized attitudes, are urgently needed."

<sup>8</sup> Cf. Chapter IV, pp. 119-20.

<sup>9</sup> "Briefly, the Rorschach method may be described as a projective technique employing a series of standardized ink-blot to elicit responses, which, when studied tend to reveal the mental processes and mechanisms whereby the subject selects and organizes his life experiences in his efforts toward self-adjustment. Personality is reconstructed from projected material (responses) both in its intellectual and non-intellectual facets. Deductions are made concerning intellectual qualities. The subject's inner world is probed, his emotions appraised in their dynamic or disintegrative activity, and his occupations, interests, attitudes, talents and personal values revealed" (39, 67).

ments can at least be stated in skeleton form. Rapaport, (78, 7-8), in discussing this concept, uses analogies very suggestive of present thinking in perception:

The process of projection itself is no enigma, though only fragments of the rules governing it are known to us. It is known that our mind does not receive stimulations as a movie screen receives pictures projected on it, but rather acts like marble which breaks under a blow in the direction of its own grain and veins; thus it can be no surprise that even simple perception, when closely scrutinized, will bear characteristics not only of the perceived object but also of the perceiving subject. The more difficult the conditions of perceiving the object, the more clearly the percept bears characteristics of the perceiving subject (. . . seeing trees in a dark forest as stalking enemies). The process of projection is given in the nature of human reaction.<sup>10</sup>

The supposedly unique advantage of the Rorschach is its relatively "unstructured" or "meaningless" quality. Thus, in the absence of actual initiating material, the subject is left only with his own personal fund of experiences, and these, it is assumed, he "projects" onto the meaningless background in a pattern characteristic of his usual reactive integration.<sup>11</sup> Rapaport (78, 90-1, 91) explains how this is effected:

These considerations may prompt the examiner to see in the subject's reaction to the

<sup>10</sup> This specialized use of "projection" is distinct from the connotation in psychological optics, where the term refers to the phenomenon in which objects are perceived as "out there" in space, implying that retinal and cortical patterns are "projected" as coextensive in space with the stimulating objects.

<sup>11</sup> The term "unstructured" is, of course, a purely relative one, since even the perceptual experiences of everyday life exceed the limits of the stimulus circumstances. "The present view, therefore, invalidates any sharp distinction between 'structured' and 'unstructured' perceptual raw material. According to this view, the perceptual process only becomes more extensive and conspicuous in its organizing aspect when dealing with so-called 'unstructured material' (78, 89-90).



Rorschach ink-blots a perceptual organizing process which has a fundamental continuity with perception in everyday life. However, while everyday perceptions allow conventions, specific memories, and familiarities to obscure the active nature of the perceptual process, the Rorschach ink-blots bring the active organizing aspect of perception into the foreground and provide the examiner with a treasure of insight into hidden aspects of an individual's adjustment or maladjustment.

In the Rorschach Test, the subject must draw new ideas relevant to the stimulus from internal ideas, images, and relationships; and thus the coming about of a Rorschach response requires an association process leading to it, since the response-content is not given in the ink-blot.

The problems of standardization encountered in the extension of the Rorschach are not particularly relevant to the present study, although it is safe to assume that any clarification of the theoretical bases of the method would inevitably contribute to its further validation. But others of the problems still responsible for the resistance against which the method must operate are very much in keeping. Munroe (69, 32, 38), writing on the subject of the status of the Rorschach in the total field of psychology, selects as the main issues the theoretical ones:

It is certainly true the test suffers from lack of clarity in its basic assumptions, and also fails as yet to make the full contribution to the general understanding of personality implicit in its empirical success.

The Rorschach emerged from the clinic

rather than the laboratory, and while Rorschachers have *in fact* been trying to solve this new methodological problem, they have not as a rule been very much aware of what they were doing in *principle*.

Evidently the time is approaching, even for proponents of the Rorschach, when practical success of the method will not sustain it alone, unless there is laboratory verification, in addition. It is the writer's belief that one of the first of the aspects which must submit to this test is the psychological genesis of the Rorschach factors themselves—that is, how do form, color, movement, shading, and texture operate with such precision in discriminating personality characteristics?

Here, then, is some of the background which preceded the present study. The origin of the problem is a product of interest and experience in the clinical field. But it unfolds, basically, as a problem in perceptual processes; and the exploration of perception is, as we have already indicated, historically one of the most fruitful contributions of the area of experimental psychology. What blind alleys the clinical area has not been able to avoid in its own territory it has been felt might be circumvented with the fresh viewpoints, materials, and methods of another area.

In the following chapters a more detailed consideration of the problem will be undertaken in particular relation to the contemporary setting from which it draws significance.

## CHAPTER II

### THE STATUS OF PERCEPTION IN PSYCHOLOGY

THE accumulating body of knowledge testifying to the complexity of perception very early cracked the thin shells of theory encasing the traditional viewpoints. The need became markedly acute for some form of expression which could accommodate dynamic relationships, now no longer of a literal, geometric point-to-point variety but ostensibly organizational and constructive in their tendencies. Wertheimer (55, 53) foreshadowed these requirements when he proposed in 1911 a physiological (*i.e.*, isomorphic) theory for psychology. Köhler (57, 55-6), who was later to give concrete form to that proposal, commented of the trends that "Our present knowledge of human perception leaves no doubt as to the general form of any theory which is to do justice to such knowledge: a theory of perception must be a *field* theory," that is to say, a concept of a continuous medium in which events in one part influence events in other regions "... in a way that depends directly on the properties of both in their relation to each other."

The field idea was not original with Köhler; but came, instead, directly from physics, where it had already taken functional shape. There, ever since Faraday (55, 41-2) explained electrical attractions and repulsions of bodies by processes occurring in the medium between, physical interpretations had been formulated in terms of *fields*. Clerk Maxwell, following the lead set by Faraday, referred to electric and magnetic fields as carriers of forces and deduced the velocity of propagation of such forces; while Einstein, in his subsequent theory of gravitation, replaced actions occurring at distances by proposing the gravitational field. As Koff-

ka (55, 42) reviews the sequence, "Empty space as mere geometrical nothingness vanished from physics, being replaced by a definitely distributed system of strains and stresses, gravitational and electromagnetic, which determines the very geometry of space." It was the distribution of the stresses and strains conceded to determine the action of the bodies subjected to these systems; and when either the system—that is, the strains and stresses—or the body could be observed, the properties of the one were assumed to be predictable from the other.

The Gestalt psychologists, in their vigorous application of the field concept to behavior, have since drawn many analogies between psychological events and those occurring in physical states. Köhler (18, 18-9, 26, 28), in particular, has employed numerous illustrations of stationary states, distributions of physical systems, electric structure, physical communications, and asymmetries paralleled in psychological order.

Long after field action had been absorbed from inorganic to organic disciplines, Needham (70, 120) reflected that the simple illustrations so early available in the magnetic field should have established conclusively that the manifoldness of development might be inherent in physical structure itself. He was referring, of course, to the fact that when a magnet is broken, the neutral center of the original unit is observed to relinquish its state, so that one end becomes a south pole, the other a north, thereby establishing two independent magnets which duplicate the original in which they were only specialized portions. "Inactive matter has thus become the seat," in

Weiss' (106, 287) words, "of powerful action by a mere break in the continuity of the system."

One of the profound facts to emerge from these specialized applications of the field idea has been the demonstration of continuity which appears at every scientific level. And because field vocabulary has been persistently articulate wherever these commonalities occurred, it has coped with the problems of disciplines widely separated in approach and subject matter. Indeed, there is good reason to believe that its adaptation at any one level may have predictive value for the future problems and methods of a less verbal area. Hence the story of field concept in biology, where it has reached its fruition in the natural sciences to date, may be more significant for psychology than a mere comparison of terms. Renshaw (83, 11) has declared that "... the achievements of visual space, visual form, size and distance, etc., are strikingly similar instances to the developmental processes which are always active in living protoplasmic structures." Child (10, 1) went so far as to say that "... we cannot proceed far in the study of development from any point of attack without coming face to face with the great problems of biology." The embryologist's story of development, as a matter of fact, strongly prophesies the sequence of the phenomena of perception taking shape at the moment in the laboratories of psychology.

#### FIELD CONCEPT IN BIOLOGY

##### *Introduction to the Problem of Development*

It is the task of embryology to describe the phenomena of development. But development is not the sovereignty of the embryologist alone. It is a sheer matter of fact that all degrees of organic

life display more or less participation in developmental activity; and, as Child vigorously points out, confinement to vertebrate and amphibian analysis precludes some of the most disclosing evidence found entirely outside the area of eggs and embryos. The progeny of bud development, for instance, or that from aggregations of dissociated cells, may bear remarkable resemblance to the products of egg activity. And yet the widely separated points from which each type proceeds, and the supposedly different patterns by which they attain their eventual similarities, must suggest that there are correlative factors common to both. Qualified in this respect, embryonic development is actually a single phase in an entire continuum of organic development and is more appropriately characterized as one point of achievement than as an independent unique process.

Have we any basis, however, for concluding that there is real continuity among processes which eventuate in morphology and functioning of great dissemblance? The answer is confirmed at every level of inspection: living is an *orderly* process, and, as such, implies that even diversities are typical events distributed in definite patterns and proportions. Indeed, Waddington (102, 134) maintains that the most striking feature of all development is the fact that it results in structures which are recognizable as unitary, whether the unit is a whole organism or only an organ part. Among the higher organic forms are always to be found certain regularities which identify the basic pattern. Normally, these are symmetry, polarity, and repetition of structures in definite spatial and temporal orders (102, 52). The evidence is abundant for Weiss' (106, 109) statement that "There is order at



each level and there is order in the relations of the various levels."

How, then, do we account for the continuing order and regularity which we observe throughout the natural world? Weiss (106, 105) has anticipated the breadth of the problem and attempted to extract its general and persistent features:

... we must reduce the story to its last elements and discover the reasons for its inner coherence; we must elucidate the basic order in the confusing fabric of events, and find out its underlying laws. Convinced of the fundamental unity of nature, we must, eventually, relate this order to that disclosed in other fields of Science. In short, we must find the answers to the questions: *how* and *why* do things happen as they do? We must resolve the story of development into a minimum of simple and irreducible propositions which will permit us, if not to predict in detail, at least to understand in principle, the infinite variety of specific happenings.

There can be no monopolies on such scientific questions, and any attempt to assign the problem of developmental order would be purely an arbitrary fiction. We are forced to realize that the labors which biological history records in behalf of the problem are only removed in point of time from the same history being repeated in current psychology. And while it is not the function of the present study to chronicle or to evaluate the gains toward the answer which biology has supplied, it is nonetheless significant to discover the modes of attack and the degree of clarification which another area has already achieved on a question of considerable import in our own systematic progress.

### *Theoretical Approaches*

Agreement on the fact of order, but not the kind or cause, has had the historical survival in biological theory. Any number of explanations have been

tendered, and sometimes exploited; and because many of them suggest trends which have evolved later in psychological thinking, it is of consequence to note their relevance and possible influence.

That the environment may account for the specificity of development has long since been definitely eliminated. Its conditions of heat, moisture, nutrition, and oxygen admittedly affect development; and previous to a particular level of differentiation cells may even respond with an entirely changed set of properties under the influence of chemical agents active in their locality. It is more plausible, however, to envisage the environment as encouraging or retarding development than to suppose that it imparts the initiating properties. Whatever the processes responsible for differentiation in development, they are never environmental activities independent of a responsive environmental object.

Within the protoplasm of the egg itself, none of the structural features suggested has proved adequate to account for the genesis of developmental phenomena. Even the gene theory, one of the heartiest favorites, fails to support the facts of organization, for it postulates complete and identical gene representation in all the cells without then explaining how multicellular organisms can attain differentiation unless some external action determines the genic effects.

An appreciable number of attempts have been made to localize the organizing center in some skeleton framework of the protoplasm.<sup>12</sup> Schleip (70, 659), for want of a more specific expression and to avoid the introduction of any new terminology, resorted to "intimate structure" in defining the "some as yet un-

<sup>12</sup> Chemical analysis reveals a lattice arrangement of protein molecules forming the cell architecture.

known property of the protoplasm." Needham (70, 658-9) submits, however, that embryologists have long been aware that under centrifugation, egg content would completely stratify without forfeiting the basic capacity for subsequent normal development. This fact led Conklin to speak of a "spongioplasmic framework" immune to centrifugation; but additional experimentation has left little ground for even a compromise view of basic physical structure. Needham and Pirie, for example, have held in high vacuum over phosphorous pentoxide for a year the eggs of the brine shrimp, *Artemia*; Whitaker has cooled eggs of the same species to the temperature of liquid air and held others at  $10^{-6}$  mm Hg. for six months. And when normal development followed, it could only be concluded that the essential developmental "structure" of the egg must pack into highly dehydrated form without permanent injury. Furthermore, Harris and Chambers have shown that egg cytoplasm can become remarkably fluid in character and flow in currents like liquid.

Even the presence of the nucleus in the protoplasm has not been found essential for development. The experimental work of Harvey (34, 35) in 1932 and 1936 brilliantly demonstrated how, when unfertilized eggs of the sea urchin were centrifuged at speeds high and long enough to force elongation and segmentation into parts, the half consisting only of extranuclear cytoplasm would, upon contact with such parthenogenetic agents as mechanical friction, treatment with sulphuric acid, hypertonic solutions of salts or sugars, fatty acids, and fat solvents display cleavage comparable to that of a normally activated egg. Such development has been observed to proceed as far as a multicellular hollow sphere resembling the blastula stage.

Weiss (106, 194) has reported significant correlations between developmental capacity and the colloidal condition of the egg, that is, the aggregation of colloidal particles; but this, as we shall see later, leads directly into implications of dynamic, rather than static, structure. In fact, the weight of experimental evidence is so heavy against the possibilities of an interior skeleton to explain the genesis of developmental phenomena that little credence any longer holds there.

Driesch and the neo-vitalist school sought refuge from this apparent futility of the search for a material agent by postulating an abstraction as the focal point for developmental activity. Thus the now-famous (and equally infamous) non-material principle of "Entelechy" was introduced into biological vocabulary. Driesch defined Entelechy as "... intensive manifoldness as opposed to the extensive or visible manifoldness which becomes evident as development proceeds" (70, 119-20). It is almost needless to say that any such autonomous and metaphysical factor, incapable of eventual measurement, admittedly non-existent in space, and without form for its energy, is an escape without honor to a science. Weiss (106, 265) in refutation of Driesch's principle, is led to declare that "... we have discovered no facts that would conflict with the view that *the agents controlling development emanate from no other source but the corporeal system, 'germ,' and its counterplay with the material environment.*" It can be said, then, that (1) the historical sequence has witnessed a gradual subordination of structural emphasis in development wherever that structure required material representation for its functioning; but that, (2) regardless of the diminution of material emphasis, this se-



quence has yet not demonstrated a need for theoretical assistance exceeding the rigors of scientific procedure.

Structure, however, has been only one facet of a total controversy with other reflections. Witness the repeated tributes to *cell theory* with its emphasis on the autonomy of cells, like bricks that make a building; or the "mosaic" doctrine of the School of Preformation, with its accent on the latent properties of form and function in the original parts and its parallel denial that the epoch of development produces anything more distinctive than a mere addition of initial tendencies.<sup>13</sup>

What has contemporary theory substituted for these ghosts of the past? Fundamental still is the fact that it admits the same problem to persist, but its orientation in relation to that problem assumes a new role. Weiss (106, 365-6), who dramatizes the new concept in terms of activators that function as "keys" and potentialities that correspond to "locks," gives a picturesque turn to it:

One thing must be borne in mind, however: while ordinary keys are made to fit their locks, the stirring fact about development is that the key actions of the fields have never before in the actual life of the individual been in contact with the lock reactions they evoke. They are pre-fitted and their mutual correspondence, indispensable for the orderly course of development, is simply another manifestation of those pre-arranged and pre-adapted relations among parts of the organism, as well as between the organism and its environment, which are so characteristic of life; embryology can only demonstrate their operation, but cannot account for their existence.

<sup>13</sup> Needham (70, 99) reflects: "We are so accustomed in modern embryology to the concept of determination, i.e., the fixing of the fates of parts of the embryo at a definite time in development, that it is difficult to think back into the state of mind in the last century when it was supposed that fates were all fixed to begin with."

What is new, therefore, in contemporary biological thinking is not the problem of organization but the concepts about it. Where formerly order meant fixity, it now signifies continuous change; where earlier it was watched only in cross-section, it now is analyzed largely in currents. We start from the premise that order is evident, and we observe that that order is maintained so long as the whole with which we are dealing is in a state of interaction with its constituent parts. If ever the balancing relationship is upset, the order is likewise altered. Further, this interplay extends between levels of development and to valences outside the system, as well. Waddington's (102, 145) formulation of the relationships involved is very representative:

When elements of a certain degree of complexity become organized into an entity belonging to a higher level of organisation, we must suppose that the coherence of the higher level depends on properties which the isolated elements indeed possessed but which could not be exhibited until the elements entered into certain relations with one another. . . . That is to say, a new level of organization cannot be accounted for in terms of the properties of its elementary units as they behave in isolation, but is accounted for if we add to these certain other properties which the units only exhibit when in combination with one another.

We are led inevitably to describe so active an organization as dynamic, rather than static, and to forego the convenience of analyzing it as "stills" in preference to moving processes. Consequently, any morphological stage becomes merely ". . . a fixed expression of the degree of progress and perfection which the various developmental processes had reached at that time" (106, 43). Anthropological specimens that look vastly different may be sequences in time of identical dynamics—"samples", as Weiss terms them, of

stages in the same productive process. Developmental levels that evolve from a system of potentials and assume structure in the direction of specific activations cannot be appropriately represented by preserved and fixed cells since the static cell picture is the realization of only a portion of the extremes of expression to which the original germ may comply. No single phase, but the range of cellular activity, is the real prototype of the constitutional character of the cell base. This is eloquently put by Weiss (106, 102-3):

Now, an organism is not a pile [of sand]. Its parts are not simply diverse in some way. What makes an organism an organism, is that the diverse portions are *definitely grouped and arranged*, maintain *specific mutual relationships*, and conform to a pattern which is *essentially identical* for all members of a species. In other words, a definite order prevails in development which prevents the complexity from becoming confusion, and the diversity from becoming chaos. This order according to which *every part is put into its proper place, and into specific relationships with other parts*, and according to which *the activities of every part are made to comply with the plan of the whole system* to which it belongs, is called *organization*. . . . Size, shape, arrangement, mutual connection, mutual effects and interactions, proportions, activities, etc., must interlock in a unique way from which there can be no major deviation if the developed organism is to survive. The developed organism, however, can be viewed as a cross section through a cable of developmental processes. An eye is nothing but the terminal stage of a set of eye-forming processes. . . . In this light, the static organization of the formed body . . . is simply the most recent stage of the dynamic organization which has governed its formation.

The necessity to accommodate this dynamic aspect is the background for Child's (10, 6) molar approach to the complete problem of developmental activity:

. . . we are forced, by the results of experiment, to the conclusion that the axiate individual is the expression of a pattern on a larger scale than molecular or micellar pattern of a protoplasm and that factors external to the individual play a part in determining it. . . . According to this view, molecular, colloidal, chromosomal, and other patterns may be present; but they do not constitute organismic developmental pattern, nor do they autonomously give rise to it.

Organization undoubtedly involves chains of chemical reactions as development progresses, but any conceivable number of chemical reactions cannot give rise to an organismic pattern unless they are in some way definitely ordered in both space and time. The chemical reactions in development are evidently so ordered in a pattern which is spatially of molar order of magnitude and changes in an orderly manner chronologically.

#### *Nature of Organization in a Molar Concept*

Any concept of organization implies, first of all, that not all elements are of equal status. The structuring which brings forth order must invest, somehow, some factors with states of dominance and others with relative subordination, producing, thereby, a demonstration of the paradoxical destiny to which organization submits each of its parts: (1) a diminution of individual identity in behalf of the group relationship; and (2) an impetus to specialized development unique from the mass arrangement.

Not all aggregations possess the property of organization, at least in the respect that organic systems are said to exhibit it. Until a part has sacrificed enough of its unitary character to allow it to comply with the matrix to which other parts are likewise committed, it cannot "belong". That is to say that mere proximity in space and simple inertia to separate alone do not give rise

to structural status.<sup>14</sup> On the other hand, when parts become dependent upon each other, they borrow and contribute, like the members of political unions; and the totality which arises as an image of these exchanges exists and maintains itself on the energy emanating from within itself. The property, then, that exceeds the arithmetic totality is the product of the relationships between the parts, their interactions, their groupings in the mass, their mutual restrictions and activations, and their effects upon each other. These relations are essentially conditions of controlling and of being controlled, and lay the ground for the emergence of entirely new properties not recognizable in the original constituents themselves. The chemical level gives repeated evidence of these new groupings and consequent new emergences. Analysis of the adult organism, for example, shows substantially the same types of chemical materials as are present in the egg, but so diversely rearranged that entirely new compounds have come about. In the pre-gastrular stage of egg division, cells interchanged from potential ectodermal, mesodermal, and endodermal layers will generally adopt the rate and form of development characteristic of the host area, irrespective of the original destiny of the transplanted cells.

Contradictory as it appears, in this very tendency toward unification lie the

roots of ultimate independence in cellular progression. The significant contribution of much recent biological research has been the definite establishment that the shift of emphasis from homogeneity to individuation is a feat in point of time of the developmental process itself and not a mirrored fulfillment of earlier pre-determinism. The further back we probe into embryological history, the greater the similarities we observe and the more indefinite and generalized are both morphology and functioning. Forty years of experimental work, claims Needham (70, 101), have gone into the proof that at the beginning of development, parts of the egg are undetermined and that "... one of the most fundamental processes in development consists in the closing of doors, i.e., in determination, in the progressive restriction of the possible fates." The processes of organization appear to provide the impetus, whether also specific structuring or not, by which the cell comes to achieve differentiations from both its own previous self and eventually also from other cells.<sup>15</sup> From neighborwise to selfwise the cellular behavior proceeds; or, in Weiss' (106, 98-9) descriptive fashion,

... if we symbolize the different courses of cellular differentiation by a number of channels, then all these channels leave from a common center—the undifferentiated stage of the cell. By and by they diverge as the cells enter diverse lines of differentiation. All differentiation moves over these definitely established lines, and random, pathless, straying does not occur. Nor are there cross chan-

<sup>14</sup> There is no contradiction here with Wertheimer's *Factor of Proximity* (cf. page 64). Regarding that Gestalt principle of perception, Vernon (99, 111) comments: "It is truer, however, to say that proximity strengthens the force of attraction between parts rather than actually producing it. Some other factor such as similarity is responsible for the actual cohesion." According to Koffka (55, 166), "If proximity alone were a cause of organization, we should be at odds with all we know about organization in physics," where "... the effect is found to depend upon the properties of A and B in their relation to each other" (59, 280).

<sup>15</sup> Weiss (106, 107) admits that we accept a principle of emancipation and observe its effects "... without having so much as a hint as to how it may be effected." Child (10, 10), however, has suggested that the activating principle in development may do nothing more than initiate relations of dominance and subordination which then become the actual organizing instrumental elements.



nels interconnecting the separate lines; once separated, they remain separated.

The cohesiveness of the differentiated cell precludes any further concurrent activity, as though the very state of differentiation seals the destiny of all capacities and energies. Of one thing we are certain: this directional trend is basic to all animal development, regardless of the categorical differences which eventually separate them. And we shall have numerous occasions later to cite this same sequence of development in the area of perceptual experience.

#### *Field Concept; A Descriptive Vehicle for Developmental Dynamics*

Experimental data requires systematization to become verbal, and a concept must have instrumentation to be applicable. The evolution of a dynamic viewpoint in embryology created a need for a frame of reference in which the new approach might be oriented, and by means of which it might be inspected for purposes of evaluation. The field concept, already at work in the area of physics, and compatible with both a dynamic and an organizational predilection, has supplied that need, and its approximation in embryology has given vocabulary to the whole trend of current embryological theory.

What extenuating circumstances initiated the "field" idea into embryology? Spemann is generally cited as the first to have associated the concept of fields with the organization center.<sup>16</sup> Harrison

in 1918 implied the field idea in references to amphibian limb development; and since that time such reputable company as Gurwitsch, Guyenot, Schotte, De Beer, Huxley, von Bertalanffy, Waddington, Schmidt, Dalcq, and Weiss have employed the term and added greatly to its acceptance.

The trends in experimentation have demanded, above all, an elastic interpretation. Whether a cell achieves its end differentiation by its own means, or whether it yields to pressures from other sources has not been answered by the independent facts.<sup>17</sup> We have already seen that eventual determination of remarkable specificity takes its origin from cellular beginnings so homogeneous and primitive that, while still uncommitted to direction, parts can be detoured by the experimenter into highly abnormal constructs. And yet, in the normal process of differentiation, relatively limited and recognizable branchings occur out of the mass of potentials inherent in the home cell. The infinite possibilities of the environment as influence are always imminent; and yet we observe again and again that cells, though besieged by these multitudinous demands, are able, somehow, to evolve shapes and qualities typical of their species. Further, the sharp separation between mature species rules

<sup>16</sup> In 1912, preceding the introduction of the actual "field" expression, Spemann suggested that "... early embryonic potency to develop an organ such as the lens of the amphibian eye involves an area analogous to a diffraction circle, the degree of determination being highest in the center and decreasing peripherally" (10, 276). His first direct reference to the term, however, dates from 1921, when, in describing the organizer effect, he remarked on the "field of organization" apparently established by the so-called organizer (106, 290, footnote).

<sup>17</sup> Even the distinction between original potentialities and external forces still leads to some controversy. Thus, Holt (42, 9) retorts: "No 'potential character' ever is 'already contained' in anything; and the notion of potentiality, wherever used, is a mark of finalistic thinking. The contents of the germ-cell are not potential characters at all, whether bodily or mental: they are actual proteins and other substances, and to call these substances 'potential' this or that is to flout the truth. As Verlaine has said, there are no 'innate characters'. So that those persons who imagine that they are dealing with 'potential' or 'congenital' albinism, cyclopia, or lethal factor, with agoraphobia, herd instinct, or mathematical endowment, will in the end, of course, have to give place to more observant investigators who can recognize a carbohydrate or an amino acid when they see one."

out even the possibility of connective paths between forms. Weiss (106, 98) reports that there is nothing known which would resemble a hybrid between a nerve cell and a muscle cell. Normal development, apparently, is a selective preference from among tendencies, but these we are not yet equipped to specify.

There is, still, unfortunately, no unanimity of opinion in defining the field which represents this set of relationships between forces and potentialities. For Waddington, the field is a system of order characterized by the interaction of unstable entities which achieve equilibrium in compliance with a typical pattern (70, 129-30). The keynote, here, is the field effect upon original and separate conditions of instability. Huxley (47), who has elaborated considerably upon the field concept, defines it mainly in terms of the unity to which the parts become subject. Child, wary that the concept of fields may introduce a new unknown rather than delineate already existing complexity, assumes the field to imply that there are present both capacities and a controlling order for these, and thereupon postulates that developmental fields are nothing beyond quantitative gradient systems representing differentials of intensity from a supposed focus within the field. Child (10, 278),<sup>18</sup> however, has not left the gradient as a descriptive term. The gradients "... are the vectors of the field and determine its extent and the orderly relations within it." In the gradient he envisages the actual instrument of ultimate order and pattern, since he supposes that determination occurs in relation to the gradients present.

<sup>18</sup> Needham refers to the formulation of the gradient concept as Child's great contribution to biology. This tribute would doubtless receive general approbation regardless of the division of opinion over the applicability of the concept.

It is Weiss, however, who has made the most conspicuous attempts to adapt embryological data to the field frame of reference. For him, there is an essential distinction between the activations which, trigger-like, set off organization in the course of development and the spatially and temporally ordered pattern which follows the activations. The "field" he reserves for the set of organizing factors—latent formative tendencies which give rise to the pattern when the region is eventually irritated.

Weiss' own evaluation of the utility of fields is essential in understanding his use of the term. Field concept is intended neither to analyze nor to explain. It is, on the other hand, an abstraction designed to facilitate the description of a group of phenomena observed to occur with remarkable regularity and consistency; and the so-called properties of fields are construed from these observations. "If the term field were mistaken for a sort of narcotic devised to appease the mental discomfort arising from our profound ignorance of the problem of organization, its use would be highly inexpedient" (106, 292). Weiss (106, 293), instead, proposes to employ it as an object of research, "... as something which apparently exists and whose characters can be determined and described."

The potencies of the field exhibit two independent characteristics: (1) they include pattern tendencies, i.e., characteristics of size, localization, proportion, connection, sequence, rate, duration; and (2) they supply the energy with which the pattern may be effected. The second must obviously be distinguished from the first to allow for the fact that the very orderliness of differentiation requires that adjoining fields balance each other. Were not some prevention of monopoly existent, an area like the eye field



might, in a period of activity, claim the entire head region unless competition from adjacent areas restricted its spread. Such balancing effects we can only explain as evidences of energy intensity with which the pattern is executed. Both of these properties, then—energy for execution, and pattern for organization—signify for Weiss the nature of the "field". The complete developmental act requires these tendencies of the fields and an activating principle to set the tendencies into operation.

Weiss acknowledges that we have progressed substantially further in understanding the activating principle than the organizing one. There is evidence, for instance, that the sperm is not a prerequisite for development. Spontaneous development is observed to take place in some arthropods; eggs of the silkworm have responded as a result of mechanical friction; a wide variety of natural and synthetic chemical agents, as well as thermal, photic, and physical means have proved capable of initiating development in unfertilized sea urchin eggs; the frog egg has responded to only the puncture of a needle; and a laceration in the hydroid *Corymorpha* has produced detectable development. Even more exceptional signs of organization appear in the processes of emancipation as the homogeneity of the germ yields to differentiation. Needham (70, 174) reports that at some early stage, probably a specific point for each specific tissue, all tissues are capable of releasing inductive influence. The origin of the amphibian lens as described by Weiss (106, 331-2) is a case which illustrates this inductive relationship between tissues:

The morphological development of the amphibian lens is as follows: as the lateral bulge of the eye vesicle approaches the skin and transforms into the eye cup, the skin within

the area of contact thickens and forms a cushion-shaped body, the *lens placode*. As the eye cup deepens, the basal layer of the placode becomes curved with the convexity facing the cup. The curvature increases, until the plate is completely bent into a vesicle, the *lens vesicle*. This vesicle is then pinched off from the ectodermal covering and sinks into the hollow of the eye cup. The cells facing outward become a flat epithelium (*lens epithelium*), while the cells facing the eye differentiate into long and regularly arranged structures, the so-called *lens fibers*.

When the prospective eye primordium of one side is radically removed from the neurula or eye-vesicle stage of a grass frog (*Rana fusca*), the operated side remains permanently *eyeless*. But in addition, *the lens also fails to develop*. Since the lens-forming ectoderm was not injured in the operation, its failure to produce a lens must be ascribed to the elimination of some factor, specific or unspecific, contained in the eye vesicle and indispensable for lens development. That the factor is *specific*, is demonstrated by the reciprocal experiment, in which the extirpated eye rudiment of the grass frog is brought in contact with a strange skin region in which lenses do not normally arise. This can be done either by transplanting an eye vesicle under the skin of the belly, or by grafting a flap of belly ectoderm in the place of the presumptive lens ectoderm over the intact eye vesicle. In either case, *the strange ectoderm in contact with the eye vesicle readily furnishes a lens* the size of which matches the size of the eye bulb.

It was with respect to the functioning of the activating principle that Spemann and Mangold contributed so brilliantly in 1924. They were able to show that, up to a certain stage in the development of the embryo, most parts are interchangeable with each other. The distinct evidence for this appeared when presumptive chorda-mesoderm, transplanted from the dorsal lip of the blastopore to an indifferent part of another embryo, proceeded to invaginate in its own intrinsic way, even against the polarity of the

host, and induced in the host ectoderm the formation of a second embryo with neural tissue.<sup>19</sup> Whatever the activating agent, clearly its introduction into the field initiates a stream of developmental phenomena of very extensive dimensions.<sup>20</sup>

But there is still more impressive evidence on the nature of activation. Holtfreter (43, 44) announced the stirring finding that even dead tissue may exhibit inductive capacities; boiling, freezing, drying, or immersion in organic solvents has not deprived the tissue of its power to provoke development. And in addition, parts of the egg without observable activating power in the living state have been able to induce after being subjected to boiling. Spemann construed this evidence to substantiate his earlier impressions that induction is hardly an imparting effect, but rather a releasing one, since a "dead organizer" is a veritable contradiction. One is reminded again of Weiss' ascription of both energy and pattern to the field, awaiting only induction to set them in motion.

In spite of the dramatic qualities of this evidence and the host of experimental work in biochemistry to substantiate it, no indisputable identification is available for the primary activat-

ing elements. Child is willing to state that metabolism appears to be the effective factor in the progress of development and that chemical substances are the actual agents. It is true, of course, that a general *trend* is cited for chemical change in the living system, toward transformation of open chemical structures into ring-shaped ones and the joining of smaller molecules to larger ones. Needham concurs that smoothly-operating metabolic processes may be intimately bound up with fundamental morphological expressions, but he also adds that the chief conceptual difficulty arises for the biochemist from the fact that the cohesive forces which are present in embryological organization appear to operate on what he designates as a supra-chemical level. Information on the colloidal nature of organic systems has likewise led to the suggestion that the characteristics of a dispersion medium might attribute to the phenomena of development, namely, the predominance of surface area, maintaining forces and tensions along phase boundaries, and the natural tendency of a dispersed system to decrease its disparity by the aggregation of particles into larger units. Needham is among those who claim that the mere complexity of the colloidal constitution of protoplasm is enough to have prevented any attempts to look outside the egg for the manifoldness which it exhibits.

### *Some Appraisal of Field Concept*

Has field concept contributed to embryological theory? There seems to be agreement that the answer can only be negative if the concept is expected to produce new principles not already established in fact or if the concept becomes a mere verbal protection for lack

<sup>19</sup> The original statement of these findings appeared in *Roux Arch.*, 1931, 123, in a report by Spemann entitled "Über den Anteil von Implantat und Wirtskern an der Orientierung und Beschaffenheit der induzierten Embryonalanlage." This original treatise has since been followed by a compilation of Spemann's Silliman Lectures at Yale University (98), dealing at length with subsequent experimental work which adds to the concept of induction. This latter volume Needham declares to be "the most important event since 1931."

<sup>20</sup> Waddington has introduced the term "evocation" to refer to the inductive effects of the activator, and "individuation" to denote regional determination emerging in conformity to the host. Neither term, however, appears to contribute any more to our understanding of activation than a little color in verbal expression.

of knowledge. Child (11)<sup>21</sup> prefers to use it only with reservation because it does not afford new explanations for the phenomena it depicts, and he takes Weiss to task for giving prominence to the concept without explaining how a field may be an active factor in development, what the source of its energy may be, and what makes a field weak or strong. Needham is clear to emphasize that lack of agreement in defining extends the variety of applications—and ambiguities—which the term engenders. Still more criticism comes from Schutt who sharply observes that fields which have no localizable centers and whose strength cannot be measured are thereby not comparable with the fields of physics.

Negations, however, are only partial truths. The significance of a concept never lies as much in what it cannot do as in what it can. When field concept is conceded to be instrumental in portraying an already functioning set of principles, there are many positive testimonies. Waddington (102, 134-5, 139), whose comments may be taken as typical, regards it most favorably as a mode of dealing with formative processes in which relatedness is more significant than their separate characteristics. Thus:

The "lens field" should be taken to refer to those properties of a region of tissue by virtue of which the lens assumes a definite shape, with a certain configuration of lens fibers, etc. One can compare this biological usage with the usage in physics, where the field concept may be used, for example, to describe the course of the tubes of force in the neighbourhood of a magnet, or the distribution of potential near an electrically charged body. In these cases, we know the types of force, magnetic or electrical, which underlie the field. In the case of the lens

field, we know much less of the nature of the underlying force, although we may suppose that it has something to do with the mutual repulsions and attractions of fibre-like lens proteins. But even if we do not know what the lens field is a field of, the field concept is a convenient way of expressing the fact that the underlying force is distributed in an orderly way which leads to the production of a structure with a definite and orderly pattern. It emphasizes the fact that our aim must be to discover the spatially extended set of coordinated forces which work together to produce an organ.

In all these examples, the value of the field concept has been that it emphasizes the fact that several phenomena are coordinated with one another in such a way that they can all be grasped as a single whole; and it encourages one, when confronted with an apparently simple and isolated occurrence, to look more closely to see if this is not really only the most striking member of a larger set.

#### GESTALT: EXPRESSION OF FIELD THEORY IN PSYCHOLOGY

Von Ehrenfels<sup>22</sup> is credited with having originated the term *Gestalt* (73, 47). Wertheimer's (18, 71) oft-quoted passage of 1923 dramatically crystallizes the approach to the Gestalt<sup>23</sup> way of thinking:

I stand at the window and see a house, trees, sky.

Theoretically I might say there were 327 brightnesses and nuances of colour. Do I have "327"? No. I have sky, house, and trees. It

<sup>22</sup> He is not, however, to be identified thereby with the group of psychologists who comprised the pioneer Gestalt school. Although his foresight in sensing a significance in melodic transposition anticipated some of the later Gestalt theory, his interpretation in terms of *Gestaltqualität*, a concept of relations between tones, was actually an added element of a higher order. This was quite different from the later Gestalt view of part-to-whole relationships (5, 16-7).

<sup>23</sup> The word *Gestalt* has been variously defined, but Spearman's translation of "shape" is probably the most widely accepted. Wever (111, 202, footnote), however, employs *Gestalt* to signify "form," while *shape* is used to denote a sort of "expanse" or "extent." Many psychologists have felt that there is no English equivalent for the original and have preferred to retain the German word.

<sup>21</sup> Elsewhere, however, Child (10, 272) states in reservation that we know little about the particular chemical reactions and how they differ at different levels.



is impossible to achieve "327" as such. And yet even though such droll calculation were possible—and implied, say, for the house 120, the trees 90, the sky 117—I should at least have *this* arrangement and division of the total, and not, say, 127 and 100 and 100; or 150 and 177.

The concrete division which I *see* is not determined by some arbitrary mode of organization lying solely within my own pleasure; instead I see the arrangement and division which is given there before me.

The problem with which the nativists and empiricists had grappled—and which eventually became the heritage of the Gestaltists—is the problem of the order and meaning of perceptual experience. All the influences upon the organism are recognized to exist haphazardly; why, therefore, is not the organism's experience likewise haphazard? "Actually, of course, no such thing happens," writes Köhler (18, 55), "for local processes are *not* arbitrary but evince, rather, a clearly defined organization relative to the needs and conditions of the organism as a whole." Without, therefore, requiring forces beyond the natural events themselves, Gestaltists are able to explain the order of behavior by assigning it to the organization to which behavioral events submit themselves (55, 17).

As natural events are taken to explain their own order, so the phenomenal is assumed to hold nothing intrinsically unique, and the correlatives of psychological organization they seek ultimately in physical terms. Koffka (55, 48), who insists on the necessity for "one universe of discourse," contends that the organism is no more than a physico-chemical system whose actions can eventually be accounted for only as physical processes within a physical system. "If an action is reducible to a causal sequence of organic processes, it becomes intelligible because it is then reduced to one uni-

verse of discourse which is the same as that in which its actual movements take place." Köhler (18, 62-3) sees in the dynamic phenomena of perception conspicuous resemblances to the principles of physical distributions, and from the parallel relationships derives the principle of isomorphism which was stimulated by Wertheimer (55, 56). That principle, in brief, may be stated as follows: "The somatic processes underlying static visual fields are stationary equilibrium distributions developed from the inner dynamics of the optical system itself; the spatial order and articulation of a visual field correspond to the physically real structure of this stationary process."<sup>24</sup> Thus perception, in the Gestalt viewpoint, is undergirded with fundamental physical dynamics (5, 246), and emerges as an achievement of the central nervous system (99, 89), a process in which minimal stimulus energies release larger-order nerve energies, and these, in turn, the still larger energies of the muscular structures (55, 99, 100).

But Gestaltists have still to explain *how* psychophysical processes give rise to organized, and not chaotic, perceptual acts. *A priori*, the nature of the physical system would exclude the expectancy that retinal points must be bound invariably to corresponding cortical points. "For Gestalt theory the lines of flow are free to follow different paths within the homogeneous conducting system, and the place where a given line of flow will end in the central field is determined in every case by the conditions in the system as a whole" (18, 50). It therefore follows, according to Wertheimer (18, 88, footnote), "... that the apparatus of recep-

<sup>24</sup> Additional elaborations of the isomorphic principle are treated in Boring (5, 83-4, 90), Ellis (18, 395), Parsons (73, 47), Köhler (57, 46; 60, 193).

tion cannot be described as a piecewise-sort of mechanism. It must be of such a nature as to be able to *grasp the inner necessity* of articulated wholes." In such case, apprehension—to borrow Wertheimer's phrase—can only proceed "from above," and parts cannot even be experienced independent of the whole. There are no blind and adventitious combinations (18, 14), no mosaics in space and time (18, 389), no "blooming, buzzing confusions" (55, 67). The articulations which arise are lawfully predetermined, and the organization in perception is already given in the process and the materials. Not even the mere fact of relatedness is binding unless it emanates from the totality. "In order to distinguish between relations one must first have a principle of selection, and this can be obtained only from the whole itself" (18, 391).

What, then, is Gestalt theory? For Köhler (18, 55) it is a "way of thinking"; for Wertheimer (18, 2), "not only an *outcome* but a *device*," whose fundamental formula is: "There are wholes, the behavior of which is not determined by that of their individual elements, but where the part processes are themselves determined by the intrinsic nature of the whole." This, in brief, is the Gestalt attitude in treating the phenomena of perception.

#### GESTALT PRINCIPLES OF PERCEPTUAL ORGANIZATION

When Helson (36) surveyed the Gestalt literature in 1933, he was able to assemble 114 laws of articulation which had been formulated to that time. Boring (5, 253), unwilling to say that any half-dozen of these had yet earned scientific approbation outside their specific Gestalt context, is nevertheless forced to ad-

mit that an impressive importance has become attached to certain of the principles. Gestalt psychology, by definition, is committed to the demonstration of the lawfulness by which stimulus distribution is organized in perception; and the principles which have been evolved, in conformity with the Gestalt point of view, are descriptions of the tendencies displayed by the whole processes and their parts (52, 29).

Most of the principles have been phrased in the vocabulary of perception, reflective of the fact that the bulk of Gestalt research has occurred in this area. According to Vernon (99, 102),<sup>25</sup> there are two classes of influence indicated throughout: (1) *internal forces* operating to stabilize perceptual experience; and (2) *external forces* inherent in the retinal stimulation, which operate to retain as much conformity as possible with the pattern of the retinal stimulation. Interestingly enough, this descriptive dichotomy unites both separate tendencies most emphasized in the historical viewpoints. For our present purposes, it will be sufficient to indicate only the major principles; but even with these, it is essential to note that they group themselves into two functional distinctions, that is, those principles appropriate to a longitudinal description which follows the course of the dynamic currents, and those involved in a cross-sectional report which X-rays the degree of field structuring displayed by the figure-ground pattern. This is not, of course, to overlook the fact that the latter articulation can only occur in response to dynamic operations.

<sup>25</sup> The classification of forces as "internal" and "external" is borrowed from Koffka.

1. *Naturalness of form.*<sup>26</sup>

The stimulus distributions at the retinae are never equal in impression value throughout their pattern. The field tends at once to organize, and those things which can relate to each other do so, giving rise to form. The perceiver evolves the best form possible in view of the factors of size, brightness, position, movement, appurtenance, etc. Other things being equal, the configuration perceived will tend to include as much of the field as possible (99, 105).

2. *Figure and ground.*

The form-quality of field organization is of the nature of a figure set in or on one or more grounds. The simplest form is a figure of undifferentiated quality set upon a ground. The emergence of figure from ground—Stern's "disembedding"—gives rise to forms and meaning.

3. *Articulation.*

Forms vary from simple to complex according to the degree of articulation which they possess. They occur in differentiations from semi-"chaos" to completeness and clarity (18, 389).

4. *Good and poor forms.*

A good form is good because of the degree of structural organization which it possesses. As such it has high impression potency, is resistant to distortion, is persistent, and is easier to recall. Thus, a straight line is a more stable structure than a broken line, and, other conditions being favorable, a straight line will tend to continue as such (55, 153). This is Wertheimer's *Law of Good Continuation*. Koffka uses it to account for the fact that rectangles appear everywhere in spite of the distortion of their angles, because a true rectangle is a better organized figure than the slightly inaccurate one (55, 141).

5. *Strong and weak forms.*

A strong form coheres and resists

<sup>26</sup> This follows essentially the classification used by Boring (5, 253-4) and Renshaw (82, 14-5).

disintegration by analysis into parts or by fusion with another form.

6. *Open and closed forms.*

Whenever a form approaches a stable equilibrium it has achieved closure, or the tendency toward smoothness, simplicity, and stability. Before this state is reached, form will tend to change in the direction of more and more stable organization. This is consistent with physical processes, where distributions tend toward a minimum of energy (55, 108). Wertheimer formulated the principle as his *Factor of Closure*.<sup>27</sup> The phenomenon is also referred to as "perceptual filling," and may, by the addition of parts, be responsible for the achievement of "good" configuration.

Continuous completed figures are more readily perceived and evince more stability and persistency than discontinuous ones. According to Rothschild, the greater the complexity of the original stimulating form, the greater the amount of simplification in the after-image (99, 103).

7. *Dynamic basis of form.*

Forms are instances of field dynamics, in which the field derives from the dynamic system within the organism. The course of the form is determined more by what the organism does than by the physical properties of the initiating stimulus pattern. There need, then, be no correspondence between the form of the stimulus and the form of the perception. Of several geometrically possible organizations, that one will actually occur which possesses the most stable form.

8. *Persistence of form.*

A form, once perceived, tends to persist and to recur when the stimulus situation recurs which provoked it. The recurrence of part of a previously perceived form tends to reinstate the whole.

<sup>27</sup> Wertheimer's factors, or laws of organization, are discussed in Ellis (18, 74 ff).



9. *Constancy of form.*

Forms tend to maintain and preserve original size, shape, brightness, color, etc., in spite of the fact that they may be experienced in a new setting unfavorable to the maintenance of these properties. This is the well-known "constancy phenomenon." Here the idea of invariance indicates that a shift in one part of a configuration is accompanied by equal shifts in other parts, and hence essential relationships are still preserved. Experienced arrangement is bounded by a framework in the main directions (vertical and horizontal) of space, and the ensuing relations among the several parts mean that movements of the eyes, head, and body, while affecting the retinal pattern, do not disturb the framework status.

10. *Symmetry of form.*

A form tends toward symmetry, balance, and proportion. Most of the so-called geometrical "illusions" are illustrations of this point.

11. *Integration of similars.*

Units similar in size, shape, and color tend to combine into more stable structures. This is Wertheimer's *Factor of Similarity*, that is, the tendency of like parts to band together. This refers not only to similarity versus dissimilarity, but to *more and less dissimilarity*.

12. *Integration of adjacents.*

Two similar objects in a field will tend to combine with a force decreasing with the distance between them. This is Wertheimer's *Factor of Proximity*, that is, that that form of grouping is most natural which involves the smallest interval, regardless of the number of stimuli points. This is not to say, however, that proximity in space *per se* determines organization. When two heterogeneous parts combine to form a group, under the influence of proximity, spatial relations are assumed to have aided other respects in which they were likewise congenial (55, 167).

13. *Meaningfulness of forms.*

A form tends to be meaningful and

to have objectivity. The more meaningful the form, the stronger it is, the more easily it is perceived, the longer it persists, and the more easily it is recalled.

14. *Fusion of forms.*

Two or more forms may fuse, giving rise to a new and different form. The simpler and more poorly articulated the forms, the greater the possibility of fusion. The more meaningful a form, the greater is the likelihood of its dominance over less meaningful ones.

15. *Transposition of form.*

A form exists independently of its constituent elements and may be transposed without change to other elements.

16. *Common fate of forms.*

Shifts in position which upset structural groupings will destroy unity, coherency, and ease of perception of form. This is Wertheimer's *Factor of Uniform Destiny*.

17. *Law of Prägnanz.*

As first stated by Wertheimer, "... psychological organization will always be as 'good'<sup>28</sup> as the prevailing conditions will allow" (55, 110). The change in organization of stimulus material does not occur in proportion to the actual change in condition of the stimulus but in ratio to the impression power of the stimulus condition prevailing. Thus, a continuous change in the stimulus situation may produce a series of discontinuous results reflective of the fluctuating levels which occur as maximal impressive potencies are interrupted by minimal conditions.

#### FIELD STRUCTURING: THE FIGURE-GROUND DESCRIPTION

In Gestalt theory, the earliest effect of

<sup>28</sup> "Goodness" is undefined, here; but it is understood to include such factors as symmetry, regularity, unification, continuity, inclusiveness, and good articulation (99, 102). Köhler (18, 54) reports that the physicists P. Curie and Mach have shown that until asymmetry arises in physical systems, certain natural processes cannot take place.

organization in the field is a differentiation into two phenomenal parts (99, 91). This is essentially a break in the original homogeneity of the stimulus distribution and becomes the first step in the ordering of behavioral events. Koffka (55, 72)

speaks of these emergents as "things" and "not-things" and notes that "things" tend to appear within "not-things"; von Hornbostel refers to "things" and "the holes between" (55, 208). From Rubin's monumental study in visual form per-

TABLE 1  
MAJOR CHARACTERISTICS OF FIGURE AND GROUND

Figure	Ground
Has form	Has no form
Is thing-like, object-like; solid, firm, dense, hard	Is nature of substance, stuff; loose, empty
Is highly structured	Is filmy, less articulated, more uniform, more primitive
Has surface color (i.e., color localized on the surface and impenetrable)	Has soft and yielding colors
Shown convex tendency; stands out in space, usually in front of ground <sup>a</sup>	Shows concave tendency; recedes; appears behind figure
Colors appear earlier and more clearly <sup>b</sup>	Color arises more gradually
Is smaller in area <sup>c</sup>	Is larger in area
Is brighter	Is duller
Is more insistent, impressive <sup>d</sup>	Is less prominent
Is enclosed	Is enclosing
Contrasts with other figures more readily	Contrasts less readily with other grounds
Is structured by its contour <sup>e</sup>	Is unaffected by figure contour
Is functionally dependent upon the field for its characteristics <sup>f</sup>	Is a supporting framework
Tends to persist on second presentation <sup>g</sup>	
Is named sooner	
Is more subject to meanings, feelings, aesthetic values	

<sup>a</sup> Von Hornbostel (100, 154) characterized the inversions of reversible perspective as changes from convex to concave, finding convex directions more resistant to inversion than concave.

<sup>b</sup> That is, the color limen has a larger value for figure than the same area perceived as ground (24, 92-3).

<sup>c</sup> Rubin (and later Graham) found that area is the separating mechanism when figure and ground are of equal brightness (84, 29).

<sup>d</sup> In the flicker test, Hartmann (55, 187) found that difference in readiness to fuse between groundal and figural fields is the same difference between simple and more complex figures.

<sup>e</sup> The function of contour for figure was shown by Rubin to be one-sided, that is, influential toward its inside but not the outside. He listed as aspects of the contour: (1) the figure derives its form from the contour; (2) the ground is uninterrupted by contour and extends beneath the figure; (3) contour is colorless and without breadth; (4) the surface is a unity, but contour may have several components (111, 205). Changing the boundary function of a contour is certain to dissolve the figure (18, 115).

<sup>f</sup> Koffka (55, 211) cites, in substantiation of this point, the fact that when the after-image of a circle is projected on a plane that is not frontal-parallel, it will appear as an ellipse.

<sup>g</sup> Rubin determined that recognition upon a second presentation depends largely upon the recurrence of the same part of the field as figure (99, 98).

ception came the terminology of "figure" for the smaller area and "ground" for the larger, and these have been most generally retained in the literature since.

Koffka (55, 43) offers a very picturesque portrayal of the changes as homogeneity gives way to structuring:

Think of yourselves as basking in the sun on a mountain meadow or on a beach, completely relaxed and at peace with the world. You are doing nothing, and your environment is not much more than a soft cloak that envelopes you and gives you rest and shelter. And now suddenly you hear a scream, "Help! Help!" How different you feel and how different your environment becomes. . . . At first your field was, to all intents and purposes, homogeneous, and you were in equilibrium with it. No action, no tension. . . . And then, when the shrill and pregnant sound pierces the lulling stillness, everything is changed. Whereas all directions were dynamically equal before, now there is one direction that stands out, one direction into which you are being pulled. This direction is charged with force, the environment seems to contract, it is as though a groove had formed in a plane surface and you were being forced down that groove.

It is such articulations which Wertheimer had in mind when he is quoted as saying: "There is a spontaneous tendency to segregate the genuine parts of the field into 'wholes' or groups, their genuine parts again as subordinate wholes" (59, 140). Genuine parts now can be expressed as figures and grounds, and the familiar Gestalt whole as the figure-ground totality. This distinction between parts of the field is impossible in a geometry of stimuli, and is the strongest Gestalt enforcement for a dynamic approach to perception that is primarily non-sensory in nature or function (80, No. 1, 3).

Wever (111, 196-8) considers the figure-ground distinction to have been reached prior to Gestalt theory, and he cites from Helmholtz, Hering, Mach, and Jastrow

in substantiation. Most of these, however, were confined to a specialized interest in the ambiguity of reversible and illusory material. By far the more significant contributions have come from the work of Rubin in which form-experience was found to be comprised of a salient figure featured upon a recessive ground. The work of Rubin has enabled the Gestaltists to account for perception in terms of a figure-ground organization.<sup>20</sup> In fact, the figure-ground phenomenon is considered the most fundamental type of perception (111, 194); and Koffka (54, 566) adds: "I have defended the view that this [figure-ground] structure is also the first phenomenon experienced by the human infant." Perception is emergence of figure from ground.

What are the forces which segregate the figure from its ground? Five principles have accumulated from Rubin to Koffka (55, 190-3) to account for the dynamics of the figure-ground articulation:

#### 1. Orientation.

Figural organizations occurring in the main directions in space—horizontal and vertical—are more easily achieved than those in other directions.

#### 2. Relative size.

When differences in size occur between two segregated areas, other things being equal, the smaller area will become the figure and the remaining larger area, the ground. By virtue of double representation, the ground extends behind the figure, even where no stimulus sustains it.

<sup>20</sup> This phenomenal structuring into figure-ground has been extended by Köhler (57, 80) to include the suggestion of electromotive operations accompanying the occurrence of perceptual processes. Thus, the figure gives rise to currents which exceed the area of origin and pervade the environment, setting up a field about the figure. An even more elaborate treatment has since appeared in Köhler and Wallach's latest monograph (61).



3. *Enclosing and enclosed areas.*

Of two segregated areas, the enclosing one will become the ground, and the enclosed the figure.

4. *Density of energy.*

Density of energy is greater in the small figure than in the larger ground, in proportion to the ratio of area between the two.

5. *Simplicity of organization.*

The figure and ground articulations will occur in such fashion that the shapes which result will be as simple as possible.

Figure and ground, then, are different experiential objects. "There is nothing intrinsic or unique about what is seen as figure," says Renshaw (83, 28). "The figure is merely the name we give to that portion of the total field which by its strength, position, resistance to distortion and similar operational properties represents the focus or point of maximum potential within the field." The forces which organize figure are stronger than those of ground, and the emergence

of figure out of the ground level enhances and affirms this inherency.

A survey of the trends leaves the important realization that perception is an active, dynamic phenomenon. If that process is to be altered, it can only be accomplished by a restructuring of the field arrangement of the forces which determine that dynamic orientation. Changed conditions in the field can change potentials there, forcing new patterns of perception to arise; the secret of the alteration lies in the aggressive re-vamping of the field organization. Non-directive theory, therefore, has no basis in experimental fact outside some active attack upon the client's present field structure. Perhaps Rogers (89, 53, 60), indirectly, has realized that fact, for he frankly admits that non-directive therapy is only effective for the client who feels adequate pressure toward reaching a solution. Surely clinical psychology has devised very poor tools if it must depend on the client to bring the implements which are required for the dynamic processes involved in therapy!

### CHAPTER III

#### THE PROBLEM

THE Gestalt researchers have contributed immeasurably to our present information about perception. That tribute would hold on the quantity and quality of their experimental work alone, regardless of the extent to which they may at times have earned the indictments so often levelled at them. They have not only been severely critical and antagonistic toward the older viewpoints, but they have countered simultaneously with positive and alternative theory of their own. They have been ingenious in devising modes of experimental attack; they have been astute in many of their appraisals; and they have often been prophetic of great needs in psychological interpretation.

But just as the atomistic approaches failed because of the extremities to which their naiveté confined them, so Gestalt, in following the pendulum-swing to the opposite end of the arc, has left unanswered many questions which have appeared in mid-course. Gestaltists themselves have admitted some of the bypassed problems, and, further, some problems of their own selection where their findings are too fragmentary still for adequate generalization. Koffka (55, 190), for one, acquiesces:

We must now raise the question as to the laws which determine the figure-ground organization, a question which has two sides. (1) why is the field structured in this particular way, and (2) which parts of the fields will become figures, which ground? Very little experimental work has been done from which we can collect data for the solution of this problem. And the little that has been done refers to the second aspect.

And from Koffka (55, 193), again, comes:

But if we could state as a law that or-

ganization takes place, at least under certain conditions, in such a way that the figure is as much of a figure as possible, then of course relative size would have a direct figure effect by its effect on energy-density. This implies that there are degrees of *figuredness*, which we could define by the ratio of the energy densities, which indeed depends upon the ratio of the areas. . . .

It is no use going any further since our theoretical deductions would lack experimental confirmation. Perhaps some reader will take up the thread where we are dropping it, and increase our knowledge of fact.

Moore spotlighted a Gestalt bias when he took Gottschaldt to task for concluding so readily that he had brought the empiricists to nought—in this case, by finding that previous repetitions of a figure do not facilitate its perception when concealed; and Foley (20, 15), in confirming Moore's stand, says in addition:

As has been pointed out above, the patterned or meaningful characteristic of a stimulus situation has, to the writer's knowledge, never been questioned. The real issue, however, is in regard to the factors which account for such patterning, and it is here that the Gestalt psychologists have usually dropped the question.

In fact, is it not true that Gestalt proponents have posed problems of their own invention as a consequence of their position? They have asked how the "rich effects" of phenomenal experience can arise from such "poor causes" as the mosaic of stimulation (55, 74-5); or, phrased in yet another way, they have stated that the problem of perception is to explain the unity of visual experience (18, 19). And when they have sought to answer their own query, they have taken refuge in external and objective conditions as the primordial organizers in phe-

nomenal events. Köhler (18, 57, 60) has made this position extraordinarily necessary to any higher-level consideration of Gestalt theory:

It is false to imply that vision consists in a mosaic of separate sensations, for the subdivisions that do appear in vision are simply those given by natural subdivisions in the visual field itself (book, pencil, ink-stand). . . . Indeed the rejected hypotheses not only misrepresent the facts but are utterly incapable of explaining even the most ordinary experiences—such, for example, as why it is that the book is one visual thing, the pencil another, and so on. That we see separate, well defined things cannot be derived from the principles of mechanistic theory. In my own opinion one cannot grasp the position of Gestalt theory until one has learned to wonder about the fact of concrete articulations in the visual field.

Such visual articulation does not depend upon extrinsic, anatomical conditions, but rather upon the concrete properties of the spatial stimulus distributions.

Whatever the process is which physiologically underlies Gestalt perception, we know that it occurs pre-consciously since articulation of the visual field is given simultaneously with the contents of vision . . . [It can be seen that] these phenomena cannot in principle depend upon higher mental abilities but are instead a result of the fundamental nature of the sensory process.

There have been reasons, however, for suspecting that Gestaltists may have been selling the whole while they held only a part. A quantity of independent studies has followed on the heel of the desiderata provoked by Gestalt theory. A number of them have been concerned with an exact determination of the initial steps in perception, and they have challenged acceptance of the Gestalt position that the process of perceptualization begins at the point of figure-ground separation. Freeman (21), working with ink-blot in an effort to slow down the stages of perceptive formation, identified a "pre-perceptive" level marked by the ob-

server's apprehension of such qualities as huddled compactness, determined direction, and scattered spread. He decided from these that form is a mere existence of visual extent, since changing the angle of presentation of a form at this level will change the organization of the extent represented. It is not until a subsequent level of "perceptive particularity" that a locus within the form becomes significant enough to carry meaning for the observer. By this level, the figure itself begins to differentiate into focal and background components, progressing from generic particularity of a "something" to specific particularity of a "thing." Freeman felt that the special significance of his findings derived from this organization within the figure itself, wherein the context of the figure is dependent upon its own focus-background totality.

A similar reference to compactness appeared also in Foley (20, 65):

It seemed clearly established, therefore, that it was the "compactness" of black-white pattern and not the conventionalized or representative nature of the context which influenced perceptual differentiation. The suggestion was offered that "compactness" is itself probably "meaningful in a behavioral sense, and is of biographical or experiential origin.

Compactness, as used here, seems to refer to proximity and density of areas of blackness and whiteness.

Bridgen (6) was able to state also that the first perceptual stage was vague, merely a "thereness." The differentiations which he obtained, by relating accuracy of reproduction of ink drawings to exposure time, led him to conclude, however, that by the time of emergence of parts, they are already patterned and unified.

Dickinson (13) followed up intensively



an earlier effort to get at the initial moment of visual experience. Although the stimulus was not described adequately enough to allow for evaluation, he corroborated the other studies already quoted by grading the order of experience as (1) bi-dimensional (mere spread), (2) tri-dimensional (depth), and (3) vagueness (unlocalized film and grey-ness). He interpreted these steps to indicate that "... the initial moment of visual experience is unlocalized but that it still carries reference to a visual quality" (13, 268). These differences in quality he construed as form distinctions, even though contours are not added until later. The earliest certainty about the forms appears dependent upon groupings of the field.

One is reminded in passing, too, that Metzger (55, 113) is quoted as reporting that initial reports on homogeneous stimulation refer to qualities of heaviness and pressure which are gradually dissipated as inhomogeneities arise and become localized.

There seem to be many reiterations of these evidences of an initial subjectivity that precedes objectification in perception. Line (64), in a careful piece of work with perceptual development in children, found no premises for the Gestalt postulation of an innate and elementary objectivity. As a matter of fact, he found significant indications of quite the contrary:

The . . . argument, from considerations of adult states of inarticulate unity, rather suggests that the significance of the first noegenetic principle has not been grasped. The quality which arises simultaneously with its phenomenal counterpart the ground, would seem to be simply the apprehension of the experience. The experience itself may involve cognition of exceedingly low intensity—and any "wholeness" that is present owes its origin either to the lack of dif-

ferentiated awareness, in which case it is not a phenomenal character, or to the extremely unclear education which is taking place (64, 105-6).

A similar British study by Cattell (9) pressed even further the question of the priority of sensory sensation over initial subjectivity. The problem had been staged for Cattell by Spearman who maintained that the intensity of the subjective experience proceeded more rapidly than the determinateness of cognition. Cattell left much of his interpretative discussion couched in semi-philosophical color, but there is little doubt, nonetheless, of his conclusion that there are often feeling states of pleasure and displeasure which precede perception itself. Lack of possibility of reference to previous experience would result in a similar felt experience. These pathemic experiences in visual perception are not only unlocalized but they carry no identification of the modality quality of the sensation which later is to develop.

Smith (97), finding that on first experience form awareness was already present, attempted to minimize exposure time sufficiently to reach a point of elimination for recognition. But in even the shortest exposures which he used this immediacy of interpretation remained. Whole recognition he eventually concluded to be universal and remarkably consistent in its appearance; but the analysis for details which follows introduces vast individual variations that defy almost any generalization. The tendencies toward analysis were absent in his six-year old observers, and he inferred that they arose in conjunction with advancing age.

What these initial subjective stages might signify functionally was only hinted at in a few of the studies just cited. Several Italian experiments have

aimed directly at the question of the relation of these early levels to the final meaningfulness of visual experience. Galli and Gemelli (20), for instance, reported that meaning appeared to be the catalyst in the constructive operations in perception and that the sensory data bore the characteristic of indeterminateness until such construction began. However, they offered nothing in explanation of the meaning itself, so that one problem was answered by substituting another. Galli and Zama (23) contradicted the Gestalt view that the form is simple data by showing that the imposition of meaning onto form adds substantially to its complexity. Gemelli's (25) remark, that it is objects and not forms, anyway, which constitute life perceptual experiences, is of the same significance.

Some question has been raised on the over-simplicity of the figure-ground duality. Jenkins (48, 42-3) protested that later writers under Gestalt theory had reduced perceptive experience to an either-or choice, whereas his observers had frequently reported various grades of organization in each of the components. As Vernon (99, 95-6) expresses it, the field is not only figure and ground, but "more figural" and "more groundal" in some sectors by virtue of added clearness and closeness of organization. Something akin to this same interpretation must have been implied in Benary's (48, 24) conclusions that an inherence to the figure specifically, rather than a figure-ground relationship, was responsible for the effects he observed with black and white contrasts.

Wever's (111, 222-5) very exhaustive study affirmed this complexity of the figure-ground phenomenon. In levels that ranged from simple through good to "perfect," he watched figure emerge in

a series of steps which Vernon (99, 92-3) summarizes:

- (1) heterogeneity between the "figure" and the "ground," each of which forms a unit;
- (2) a minimum brightness difference between the two which gradually increases; this stage is simultaneous with (1);
- (3) a region of separation which appears when (2) has reached a certain magnitude, and eventually narrows down to become the contour;
- (4) shape, however, appears before the contour is definite;
- (5) protrusion of the "figure" out and away from the "ground";
- (6) definite depth localization of the "figure";
- (7) surface texture of the "figure," filmy texture of the "ground";
- (8) halo round the "figure"—a simultaneous contrast effect.

The phenomenological manner of Gestalt research, which substitutes for analysis of elements a description of the course of experience, has excited other experimental testing. How much of the nature of perceptual processes has been missed because the observer did not reveal them spontaneously—and because the Gestalt conditions of experimentation were not designed to expose them? These have been the questions behind the studies which have explored the architectonics of perception and the role of the observer in their structuring. Such an approach, by its definition, exceeds the Gestalt objectification of the conditions which organize perceptual data.

Schumann's (93, 94, 95, 96) studies of 1900-1904 in visual space were original in this respect. He developed the concept of attention as binding figure parts into the formation of a pattern, and he attributed the potency of the pattern to the distribution of attention (73, 47). As Schumann made use of the term "atten-

tion," it implied a dynamic tendency toward spontaneous subjective structuring of the field.

The investigations of Bartlett,<sup>30</sup> referred to earlier, stand among the most significant undertaken in this area. The fact has previously been cited that Bartlett attaches cardinal importance to the selective attitude to which sensory data is submitted until a significance accrues exceeding that which the data itself would justify. This sifting tendency he has labeled "effort after meaning," indicating thereby that a satisfactory setting for sensory material climaxes in facts of meaning. For Bartlett, indeed, all cognitive processes are simply differentiations in a total meaning-seeking continuum. Since he discriminates between the definition of meaning and the conditions which give rise to it, the ambiguity of the former does not exclude us from dealing with the conditions. In the sense that Bartlett applies it, the effort toward meaning is an active endeavour to connect something that is given with something other than itself (3, 227).

In the interpretative treatment of his data, Bartlett ventures the explanation that the systematized past, and not the fragmentary present, becomes the fountainhead of dominance and hence the source of regularity and order in behavior. This is the "schema," by the aid of which he is able to implement the effort after meaning which prompts perceptive activity. The manner in which the schema supplies this function is much more certain than the mechanisms which give it its particular character:

<sup>30</sup> The methods and materials which Bartlett utilized are described in considerable detail in the original account of the study (2). The same data were employed in the fuller interpretation and evaluation of perceiving and recognizing found in his book, *Remembering* (3).

... in the course of development the special sense avenues increase in number and range, and concurrently there is an increase in number and variety of reactions. With this, and a matter of vital importance, as my experiments repeatedly show, goes a great growth of social life, and the development of means of communication. Then the "schema" determined reactions of one organism are repeatedly checked, as well as constantly facilitated, by those of others. All this growth of complexity makes circularity of reaction, mere rote recapitulation and habit behaviour often both wasteful and inefficient. A new incoming impulse must become not merely a cue setting up a series of reactions all carried out in a fixed temporal order, but a stimulus which enables us to go direct to that portion of the organized setting of past responses which is most relevant to the needs of the moment (3, 205-6).

If we could only understand how an organism achieves this, we should have advanced some way towards solving certain of the problems of memory, for in remembering we are being determined by events out of their precise order in a chronological series, and we are free from over-determination by the immediately preceding event (3, 204).

There is one way in which an organism could learn how to do this. It may be the only way. At any rate, it is the way that has been discovered and it is continually used. An organism has somehow to acquire the capacity to turn round upon its own "schemata" and to construct them afresh. This is a crucial step in organic development. It is where and why consciousness comes in; it is what gives consciousness its most prominent function. I wish I knew exactly how it was done. On the basis of my experiments I can make one suggestion, although I do so with some hesitation (3, 206).

As I will show later, its constituents may perhaps begin to be reshuffled on a basis of purely physical and physiological determinants. This method is not radical enough. So the organism discovers how to turn round upon its own "schemata," or, in other words, it becomes conscious. It may be that what then emerges is an attitude towards the massed effects of a series of past reactions. . . . Whether or not the attitude is a genetically primitive characteristic possessing this func-



tion in recall is, of course, a speculative matter. I think it is, but nothing is served by dogmatism at this point. The experiments do, however, appear to demonstrate that, at the level of human remembering, the attitude functions in the way I have suggested (3, 208).

Bartlett proceeds to suggest, on the basis of his study, some of the factors which may contribute to this fluid characteristic acquired by the mass of experience and the consequent adjustments which the schema lends to it. Feelings and imaging, in particular, he examines quite thoroughly. Important at this time, however, is his concession to the gaps which his experimental plan failed to cover. Not only is he anxious to explain the development of the schematic function, but he senses a significance in segregating the origin of the effort for meaning from the other experiential stages with which it is telescoped in usual perception.<sup>21</sup> This may be a speculative retreat from his statement that there is no perception without meaning (2, 262); or merely a duplication of Wever's (III,

<sup>21</sup> Respecting this need for segregation of conditions and processes, Bartlett (3, 191-2) has this to say: "It should now be clear why the mass of experimental investigation of recognizing has produced little but conflicting theories. Experimenters have practically universally concentrated upon what is alleged to happen at the moment of recognition. . . . At the best, however, these descriptions merely reveal specific mechanisms of recognizing, the general conditions having already been secured. They may show us what can happen when recognition takes place, but throw no light whatever upon how any, or all, of these processes are rendered possible. Perhaps an experimental study of the perceptual processes which precede any particular instance of recognizing might be able to help us to understand why sometimes the specific mechanism is by comparison and judgment, sometimes by feeling, and sometimes, apparently, by direct 'knowing' of relations. So far as I know, the attempt has never seriously been made. Experimenters have analyzed the final stage of recognizing, and each has tended to claim a complete solution in terms of his particular analysis. In fact, nobody can understand recognition by confining his attention to what happens at the moment of recognition."

195-6) interest in the amount of meaning to be posited in figure emergence from ground.

So that, although it is true that all such experiments on perceiving reveal great complexity, what must be attempted is, not merely the sorting out and naming of distinguishable processes present in the most complex cases, but the decision of what is the minimum complexity possible, and how so large a number of factors come in the course of development (2, 261).

At the beginning of this paper some of the difficulties of the search for the simple were mentioned. It is now clear that what we want is not a number of simple elements out of which at the most we could construct a toy for psychologists to play with, but a knowledge of the minimum of conditions under which an effort after meaning of a specific character can take place, and further of the ways in which such distinguishable efforts are themselves related (2, 265).

The attribution of meaning at its threshold Bartlett is forced to admit his experiments threw no light upon. Here, rather, is a starting point for further examination.

What, then, is the question for the present study? "Whatever has a history," says Bartlett (2, 256), "presents a problem. And it is no solution to stop the history at some point or other and give a name to what is found." Certainly at this point no new problem is required, for among the welter cited, enough questions have been sharpened and then abandoned unanswered to leave perception inviting.

Thus, one may suspect that something more than external order is dominant in perceptual structuring, and that figure emergence may not at all be the primary experience which the Gestaltists maintain. Wever (III, 225-6), for one, reports that "The separation-mechanism at this stage is no definite, well-marked affair, but a region of transition which may

vary in breadth." And there is other evidence from Wever (*III*, 219) on reversals at this level that make extremely questionable any uncritical acceptance of the figure stage as the origin of perception.

One may wonder how and why, in the genetic progression of perception, adult perceiving develops an analytical trend antagonistic to its primitive state. Renshaw (82, 19) poses this problem of disjunction as both positively and negatively functional in vision:

In early childhood, coherence, not disjunction, is the primary state. The child's vision, Claparède pointed out, is syncretic and diffused. The phenomenal world to the child is not an array of discrete elements but rather of vague totalities. Purdy further points out that our primary problem is to explain disjunction, not coherence. William James, thirty years earlier, pointed out that everything coheres that can cohere; and nothing separates except what must. Unless some active influence tears them apart, the parts of visual field always form a coherent unity. When a simultaneous rivalry between oculomotor tendencies is set up, disjunction is the consequence. To see effectively, therefore, one must develop the active skill of arranging conditions which will permit certain processes of the visual field to become salient while others remain groundal. Skill is not only a process of achieving coherence and banishing disjunction, but it is the proper and opportune use of the disjunctive process for the disembedding or segregation of form.

One may conjecture on the fact that unification and segregation may simultaneously oppose each other and yet jointly contribute in the structuring of the field. And, further, how they arise and operate is, according to Renshaw (82, 25, 34), still another problem:

The first term in the perceptual structuring of the retinal excitation fields is the fact of grouping. This process need be regarded as nothing more than the manifestation of the fundamental law that every field composed of segregated "parts" in different posi-

tions will tend toward a more stable organization as a figure-ground structure. The order in which such "parts" are apprehended is unknown but in the main probably follows the temporal order of emergence or disembedding.

Nor do we know the "size" (i.e., fractional groupings within the whole) of the "parts" themselves. . . . It is quite likely that the time relations among the successively apprehended groups and the intrinsic impression-index of the individual groups are the determining factors. Unity then means not a primary state of the impression but one which is attained by an active process of structuring or patterning. This will always show some dominant regions which behave as figures, with the others playing a secondary groundal role.

This second function we shall designate as segregation or disembedding. It should be noticed that by these terms we do not mean the mere selective emphasis referred to above as attending or concentrating on some feature or a total pattern. Segregation or disembedding refers to the active process of reducing virtually all portions of the pattern to the status of a ground which thus permits the figure to emerge as a sharply defined unit. The task of segregation or disembedding is often difficult because it must be accomplished in the face of the forces of aggregation which in some instances are quite strong. . . . Skill in segregation must also be developed by training. Just as in the opposite process, the mechanism is impossible or difficult to localize and the forces which control it are not open to us for direct control. It is a task for the future in research.

One may single out the effort after meaning and ask, with Bartlett, what minimal conditions give rise to significance in sensory data and how its extension becomes so complicated. Wever (*III*, 225), whose experimental interests were specialized in figural emergences, suggested that the figure-experience ". . . may be crucial in the understanding of the problem of objectification and meaning." But there are reasons to think that meaning may be more than this.

And pursuing that query raises Bartlett's complementary one on the techniques by which the organism reorders the past via the schema, about which Vernon (99, 214-5) had to say that "As to the structural nature of these [functional] schemata we are in almost complete ignorance."

If these are the cues, what problem do they leave us? It is the single, persistent question: What is the nature of the processes of perception? And by profit from the studies which have preceded this, we conclude that the form of the problem is actually two-fold: (1) a problem of designing an experimental procedure which will reduce the perceptual act to slow-motion pace and disengage the minimal and transitory processes lost in the telescoping that occurs in the hierarchy of the everyday perceptual event; and (2) a problem of ferreting out the mechanisms or determinants of structuring in the order of their activity. In establishing threshold limits, we shall of necessity be required to proceed backward and forward; and in the process of so doing, determinants related to the critical point may be expected to appear in some evidence of sequential order. If there is an answer to the derivation of meaning, perhaps it shall prove to be

identical with the very critical point which we are seeking to find.

Vernon (99, 215-6) took departure from the report of his own studies by anticipating the direction of future research. He was actually putting into other words the same problem with which the present study concerns itself:

So the naive individual believes that his percepts are completely determined by the external stimulus conditions, and are referable in their entirety to some real object or system of objects which exists outside themselves. But we have endeavoured to show that the phenomenal percept is, apart from certain broad limitations imposed by the physical nature of the light radiations, determined entirely by the established functional schemata. We are immediately aware of certain constituent parts of these schemata—for instance, feelings of familiarity, attitudes, affective tendencies, and so on; and indirectly we become aware of them by studying the nature of the perceptual content as it varies from situation to situation and individual to individual. But of their actual structure, the method by which they are established and the manner in which their individual impulsive tendencies are coordinated, we know nothing, either directly or indirectly. We have attempted to dig the ground, clear away the debris, and perhaps prepare the foundations; as yet we can not foretell the nature of the edifice to be built thereon.



## CHAPTER IV

### APPARATUS AND PROCEDURE

#### EXPERIMENTAL DESIGN

THE plan for the present investigation comprised a series of rapid tachistoscopic exposures of more or less complex picture material, in response to which observers reported their perceptual experiences while progressing through a range from complete-out-of-focus to clear in-focus. Before a discussion of the principles which led to the choice of this plan, an account of the essential features of equipment and methodology will be described in some detail.

#### A. Equipment

##### 1. Experimental setting

All of the experimental sessions took place in a small room reserved in the Experimental Laboratories exclusively for that purpose. The one window of the

room was darkened by double shades, and no light was admitted during the period of any session other than that which developed in the operation of the tachistoscope. At one end of the room was tilted a heavy wooden screen, 6' x 6' in size, surfaced with fourteen coats of aluminum paint and finished with two of silver. Directly in front of this screen appeared an individual-type classroom chair for the observer, with chair seat standing 17" from the floor and so placed that the distance of regard from the center of the screen to the observer's eye covered approximately 9' 6". On the arm of the observer's chair were a pencil and several sheets of paper available for sketching; and immediately to the right of the chair arm stood an Edison Ediphone, the dictating arm within close reach of the observer's right hand. Just behind the observer's chair was the stand

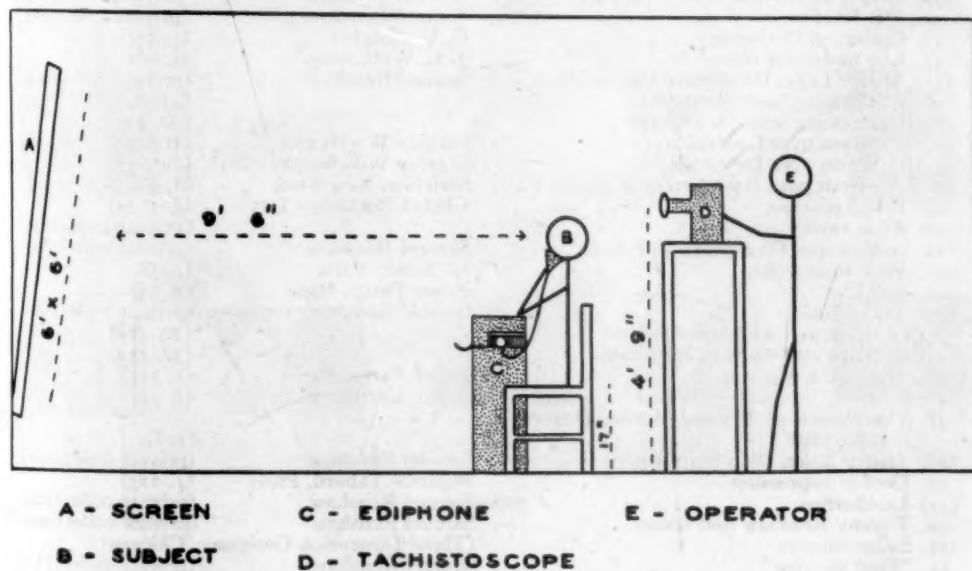


FIGURE 1  
Layout of Experimental Setting

## PRINTS OF TACHISTOSCOPIC SLIDE SERIES

1. Line drawing	Emilie Held	(private collection)
2. Pilings	Charles Lucas	(private collection)
3. Wagon wheels	Andre Kertesz, Paris	(1, 34)
4. Mt. Rainier	Samuel Renshaw	(private collection)
5. Line drawing	Emilie Held	(private collection)
6. Landscape	Andre Kertesz, Paris	(1, 88)
7. The beach at Carterets	Photo illustration, Paris	(1, 96)
(8)* Tower of Orton Hall, Ohio State University	Samuel Renshaw	(private collection)
9. Mt. Rainier	Samuel Renshaw	(private collection)
10. Lens head		(1, 4)
11. Gloria Swanson (by courtesy of Vanity Fair)	Steichen, New York	(1, 101)
12. Bridge and scull	Hans Finsler, Allemagne	(1, 72)
13. New Orleans Cathedral	Samuel Renshaw	(private collection)
14. Snow scene	Albert Rosenstiehl, Alsace	(1, 42)
(15) Hollyhocks	Samuel Renshaw	(private collection)
16. Injection of iodized oil in the canal of the medulla in the dorso-lumbar region. Radiograph	Prof. Contremoulin	(1, 29)
17. Still life	Florence Henri, Paris	(1, 32)
18. Cat	Moholy-Nagy, Berlin	(1, 104)
19. Roof tops	Herbert Boyer, Berlin	(1, 40)
20. Rowboat	Moholy-Nagy, Berlin	(1, 68)
21. Aerial view of Amiens railway station	Michaud	(1, 36)
22. Lafayette house	Andrew Wyeth	(105, 70)
23(A) Line drawing	Emilie Held	(private collection)
23(B) Line drawing	Emilie Held	(private collection)
24. Park scene	Andre Kertesz, Paris	(1, 49)
25. Double impression	Rene Zuber, Paris	(1, 56)
26. Snowy silence	Rutherford Boyd	(7, plate 222)
27(A) Lafayette house and buttonwood tree	Andrew Wyeth	(105, 71)
27(B) Buttonwood tree	Andrew Wyeth	(105, 70)
28. Chair on clothesline	Eli Lotor, Paris	(1, 51)
29(A) Autumn	Peppino Mangravite	(105, 137)
29(B) Autumn	Peppino Mangravite	(105, 137)
30. Block print	Richard B. Lukosius	(private collection)
(31) Golf course, Ohio State University	Samuel Renshaw	(private collection)
32. Mt. Rainier	Samuel Renshaw	(private collection)
33. Craters of the moon	G. W. Ritchey	(1, 55)
34. Life under the sea	J. E. Williamson	(1, 67)
(35) Mirror Lake, Ohio State University	Samuel Renshaw	(private collection)
36(A) Drawing from photograph		(32, 94)
36(B) Drawing from photograph		(32, 94)
37(A) Storm over Lanesville	Stanley Woodward	(105, 58)
37(B) Storm over Lanesville	Stanley Woodward	(105, 58)
38. The front page (by courtesy of Vanity Fair)	Steichen, New York	(1, 91)
39. Pastel portrait	Gladys Rockmore Davis	(105, 33)
40. All is vanity		(private collection)
41. Golf course, Ohio State University	Samuel Renshaw	(private collection)
42. View from a ship	Eli Lotor, Paris	(1, 58)
43. Still life	Roger Parry, Paris	(1, 65)
(44) Dandelions	Samuel Renshaw	(private collection)
45(A) Black and white composition		(32, 252)
45(B) Black and white composition		(32, 252)
46. Through a doorway		(1, 112)
47. Rose	Roger Parry, Paris	(1, 34)
48. The church at Bry-sur-Marne. Daguerrotype, 1840	Andre Kertesz, Paris	(1, 7)
(49) Mirror Lake, Ohio State University	Samuel Renshaw	(private collection)
50. Double impression	Maurice Tabard, Paris	(1, 125)
(51) Leatherlips	Samuel Renshaw	(private collection)
52. Tommy Renshaw and friend	Samuel Renshaw	(private collection)
53. Sailor counter	(Three Dimension Company, Chicago)	
54. "Find the cow"	Samuel Renshaw	(private collection)

\* Numbers in ( ) denote slides in Kodachrome colors; all others, in black-and-white.

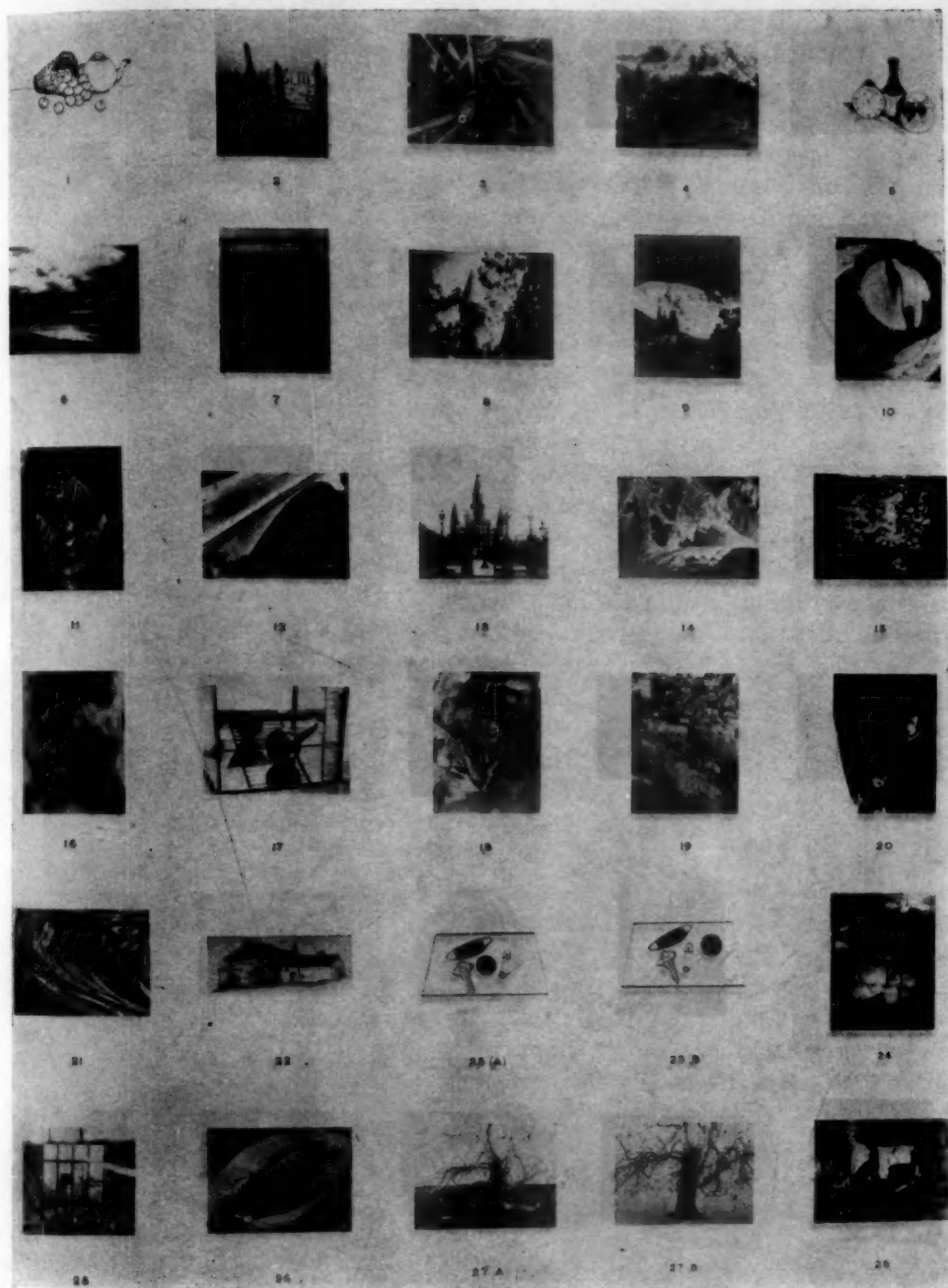


FIGURE 2

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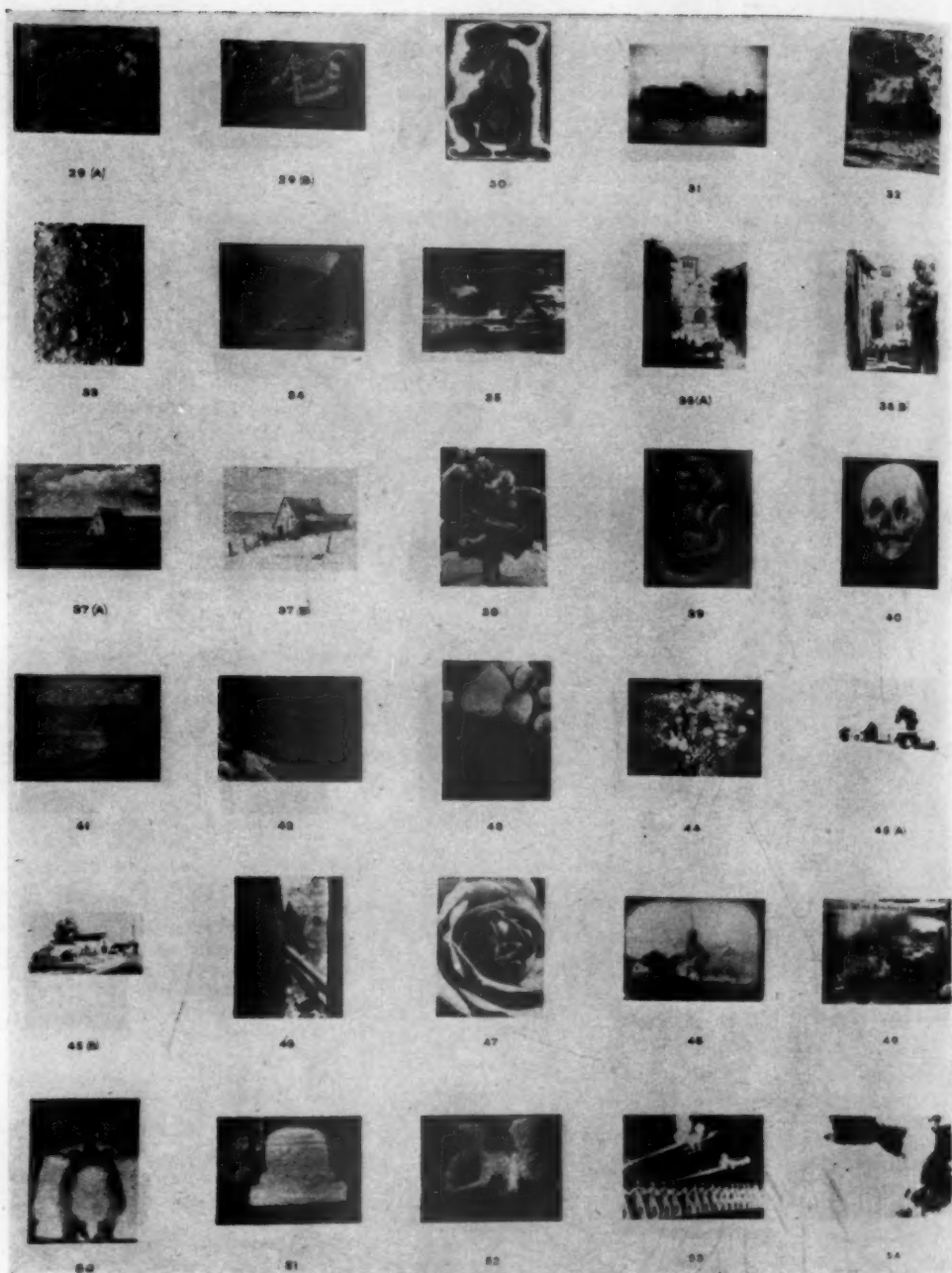


FIGURE 2 (continued)

on which the tachistoscope was posed, the center of the lens head of the machine projecting 4' 9" from the floor. (Fig. 1)

## 2. Tachistoscope

The exposure instrument was a portable Three Dimension Tachistoscope model, equipped with a 300 watt T10 lamp, a 4-inch lens, and a special Alphax shutter set with metal blades, with exposure speed adjustments from time to a minimum of 1/400 sec. The lens neck had been calibrated with a millimeter scale, set so that adjustments of the lens during focussing would register in mm changes. On the basis of the stationary location of the tachistoscope in the experimental room, mm distances could then be computed for each focal step employed in the experimental procedure (Table 2).

TABLE 2  
RANGE OF TACHISTOSCOPIC FOCAL POINTS  
FROM OUT-OF-FOCUS TO IN-FOCUS

Focal point	Distance from lens center to projection screen (in mm)
0.0 <sup>a</sup>	3651.8
1.0	3641.8
2.0	3631.8
2.5	3626.8
3.0	3621.8
3.5	3616.8
4.0	3611.8
4.5 <sup>b</sup>	3606.8

<sup>a</sup> Out-of-focus point of minimum clarity.

<sup>b</sup> In-focus point of maximum sharpness.

## 3. Stimulus material

A series of sixty pictures (Fig. 2) from a wide range of sources was assembled, photographed, and then printed or mounted on 2" x 2" slides. Of these, seven were in Kodachrome colors, the balance being the familiar black-and-white prints. The media represented

combined line drawings, watercolors, oils, tempera, ink washes, linoleum block, and photographs. Contents of the pictures ranged among landscapes, seascapes, still lifes, portraitures, abstracts, animals, nature objects, architecture, and ambiguous combinations. The technique was occasionally varied with photomontage, or double exposure. Included were six pairs of duplicate pictures (Nos. 23(A) & (B), 27(A) & (B), 29(A) & (B), 36(A) & (B), 37(A) & (B), 45(A), (B)) in which one member of each pair was altered sufficiently in secondary details to produce a different version. Composition was sometimes unified in organization, at other times complex and irregular. Throughout the entire series were pictures particularly selected as representative, in the experimenter's judgment, of the diagnostic Rorschach factors: shading (Nos. 6, 10, 16, 24, 34, 42), form (Nos. 1, 3, 5, 13, 17, 45), color (Nos. 8, 15, 31, 35, 44, 49), movement (Nos. 18, 30, 38, 50, 52, 53), and texture (Nos. 7, 11, 14, 26, 33, 43).

The selection was intentionally scaled widely, from the extremes of familiar to relatively meaningless material, in an effort to insure both free and more difficult interpretations. Bartlett (3, 3-4, 6) is no doubt right that the role of the stimulus in perception has been notably overrated; but the breadth of selection here was still considered a justifiable caution, even if not a positive contribution.

Pictures were arranged in groups of four per experimental session, but the number shown at any one session was dependent upon the speed with which the individual subject could cope with them, and not all observers were exposed to the total group of sixty. According to the tabulations in Table 3, however, 60

per cent of the total series were seen by all but one observer. Each grouping was planned with as much diversity as possible among the four pictures.

TABLE 3  
FREQUENCY OF EXPOSURE OF SLIDE SERIES

No. of observers covered	No. of slides exposed
18	10
17	17
16	7
15	5
14	3
13	4
12	1
11	1
10	1
9	1
4	1
	60

## B. Subjects

### 1. Selection

Fifteen adult subjects from the faculty and student body at Ohio State University began the original series of experimental sessions. One, two, and two-and-a-half weeks later, respectively, three additional subjects were added and continued until the required number of sessions had been fulfilled. All eighteen subjects completed the full series of experimental sessions.

The eighteen observers numbered five freshmen, one sophomore, one senior, one graduate optometrist of twelve years' experience who is currently researching in psychological optics, nine graduate students, and one Assistant Professor. The distribution of graduate and faculty observers by major departments totaled seven in psychology, one in sociology, one in German, and one in economics. Two of the observers had had at least three quarters of intensive tachisto-

scopic training with digits, and each holds a world's record in digit reproduction.

Ages of observers were scattered from 18 years to a ceiling in the mid-thirties. Men and women were equally represented, nine of each sex being included.

It will be noticed that the group of observers was entirely confined to an academic selection. This was an intentional arrangement, for the experimental plan was adjusted to both observational and introspective reports, and it was felt that the intellectual level of an all-college group was requisite for the quality and analytical detail of report which was desired.

### 2. Experimental schedules

Each subject, at the outset, was scheduled for an individual experimental session of one-half hour every other day for six weeks, or a total of eighteen sessions. In the course of the experimental runs, however, instances developed which necessitated some leniency in maintaining the intervening day between any two sessions, although in no case were any two sessions for the same observer held on the same day. The usual spacing was one to three days between sessions, with only one instance each for as many as six or seven days intervening.

At the end of five weeks of runs, the amount of data collected seemed sufficient to warrant foreclosing the sessions, and each subject was, therefore, held only for a total of fifteen sessions.

### 3. Preliminary testing

The experimental sessions, at the origin of the investigation, had been conceived as possible training devices as well as sources of data on the course of per-



ceptual behavior. The marked success of tachistoscopic training in the Psychological Laboratories of Ohio State University and in the naval recognition program during the wartime period had encouraged such an expectancy (85). For that reason, the original design called for testing with the Rorschach method before and after the total series of runs, largely because this technique relies on perceptive processes and because its results could be evaluated for possible changes in perceptual patterns as a consequence of the sessions.

In conformity with the plan, the Rorschach was administered initially to seventeen of the eighteen subjects.<sup>22</sup> Shortly, however, after the runs were underway, the training concept appeared clearly antagonistic to the primary data-gathering purpose of the sessions, and it was decided to abandon the testing phase. The instructions for the sessions had been formulated to allow a maximum of spontaneity of expression for the subjects, and structuring to produce training benefits would seem to require channeling of activity that would have jeopardized that freedom.

In the final analysis of the experimental results, the Rorschach records which were taken have not been utilized, but they are an available source of personality data on the observers, and for future examination might provide highly valuable correlative material for comparison with the present experimental findings.

#### 4. Motivation

The subjects had all been told during

the selection prior to the investigation that there was a possibility of some training increment in their modes of perception, but any promise of this was distinctly withheld.

The time exposure which followed each out-of-focus to in-focus sequence, and the opportunity given the subject to report at this level as well as at the earlier ones, were principally introduced for the expectancy of correction which they would hold out to the subject during the out-of-focus levels and the rapid flashes.

Any questions asked by subjects, such as those regarding speed of exposure, which could be answered without contaminating their naiveté regarding the picture content or the mode of response of other subjects were answered. Subjects were furthermore encouraged to express comments at the end of any session.

At the beginning of the eleventh experimental session Subject Hi<sup>23</sup> expressed a great deal of frustration at the experimenter's use of the same signal before the time exposures as before the rapid flashes; and at his request all time exposures in succeeding sessions were distinguished in advance as time instead of flash. This exception, however, occurred only for Subject Hi.

The subjects had been promised, in response to repeated queries about ambiguous material, that they would be given a reshewing of the pictures at some later time; and at the end of the entire experimental series, meetings were held for two groups of the subjects on which occasions all slides were re-exposed at time exposure and as much discussion as was desired was encouraged.

<sup>22</sup> The last subject to enter began his first session so late in the series that the Rorschach was not administered to him until completion of the fifteenth session.

<sup>23</sup> All observers will be identified in the text by coded syllables.

## C. Procedure

### 1. Instructions

At the beginning of each experimental session a few seconds were allowed for dark adaptation until the observer reported that the aluminum-painted screen was sufficiently visible for focussing. During this period on the first day, the instructions which set the stage for the entire procedure were given to the subject:

This is an experiment in perception, that is, how we see our environment. I shall throw on the screen pictures similar to those you would encounter in life experiences; but these exposures will be so rapid that unless you are right on the spot with your eyes and your mind—in fact, with your whole body—you will not get the brief flash before it is gone again.

These pictures will appear in various degrees of focus. *In every case*, I want you to give me the clearest, most definite report possible of what and how you see. You are going to help *me* with your report; and, if you make a very active effort to clinch the exposures, I think you will find that you will become increasingly proficient at this as we move along.

We shall use the dictaphone to record all your comments. You also have paper and pencil which you may use whenever sketching will make it easier for you to express or preserve your experience. You may even feel sometimes that you can do a better job standing than sitting. In other words, you are to feel as free as possible in catching the flash and in expressing your reactions as long as you make your observations at a given distance from the screen—and that is the distance of your chair from the screen. I would suggest that you focus your attention on the approximate center of the screen when I give you the signal "Ready."

For a few subjects who inquired what was meant by "how you see" the explanation was given that introspective analyses on the process of arriving at the verbal report would be welcomed whenever they were available to the subject.

### 2. Exposures

*Signal:* Preceding each exposure was a signal with which the observer had been familiarized at the first session. It consisted of

"Ready"—(approximately 1 sec. elapse)

"Now"—(approximately 1 sec. elapse)

Exposure

This signal arrangement was used before the time, as well as the flash, exposures in order to keep the procedure consistent and to avoid giving forewarning of a change of exposure by virtue of a change of procedure.

During the dark-adaptation period of the second session the observers were reminded that the rapidity of the tachistoscopic flashes necessitated a state of muscular readiness—a "reaching out" with the eyes and the body; and it was suggested that the "Ready" of the signal be a warning to assume an erect sitting posture with both feet on the floor, and the subsequent "Now" as a warning for an intake of breath. It may be noted, in passing, that some observers adhered to these suggestions for only a few sessions, but that others who incorporated them into their reactive patterns made astonishingly functional use of them. Thus, Subject Hi remarked near the end of the total series that the signal had become so natural a stimulus for a posturing attitude of the whole body that the signal itself was *felt* rather than heard, but that it would have been conspicuous had it failed to be given any time. It was this observer who had expressed annoyance at the same signal for both flash and time exposures, because, as he described it, he expended effort in preparing for the flash and developed an "organic" annoyance when his bodily effort was not rewarded. Subject Fu laughingly commented at the end of the total experi-

mental runs that if she heard "Now" outside the investigation, she would expect to react immediately by taking a breath!

*Rate:* All exposures not designated as time were given at 2.5 ms (1/400 sec.).

*Out-of-focus to in-focus sequence:* The most distinctive, and important, feature of the entire experimental plan was the out-of-focus to in-focus progression (hereinafter abbreviated to OF-IF) employed in the slide exposures. With the exception of Nos. 17 through 22, all of the slides were started at focal point 0.0 (Table 2), which produced a pronounced OF impression. Comments from some of the protocols at this level reveal the quality of the OF indistinctness:

Subject Pi: There seems to be a light portion in the center of the screen and darker portions around the edges.

Subject Wo: Just a flash of light with some vague shadow toward a—sort of left of center.

Subject Zo: There's a bright flash on the lower right-hand side of the screen, and on the left-hand half of the screen there are a lot of dark vertical lines and lighter lines there, too, and the rest of the screen is sort of a grey color.

Subject Fu: This time most of the light and dark seemed to be up and down in the picture and it looked all like straight lines. And the widest space seemed to be all in the center, and then there were wide and narrow with—extending from either side of this and just as though you'd taken lines and—or taken very long rectangles and spaced them across the pictures, one right next to each one, and these were all different shades of light and dark. However, the widest—the one that seemed to be the widest almost in the center, a little bit left of center—was the lightest one—or seemed to be.

Succeeding this point came a graduated series of six or seven<sup>34</sup> clearer and clearer

focal points, until maximum sharpness was reached at focal point 4.5. Here either two or three flash exposures at the same clarity were given, and then followed by a time exposure which was allowed to remain as long as the subject continued to report on it.

Slides Nos. 17 through 22 constituted the grouping for the fifth experimental session, and, unlike the regular procedure, were shown only at focal point 4.5. There were five repetitions of the constant focal point at 2.5 ms before the time exposure was introduced.

*Deviations in procedure:* In addition to the one day of entirely IF exposures, several other variations were interposed throughout the series to provoke new stimulating conditions. For example, slides Nos. 9 and 14 were repeated at later dates, but in inverted position on the second exposure; Slide No. 18, which had first been seen in the IF series, was introduced at the following session in OF-IF to test the emergence of recognition; duplicates with slightly altered details, which have previously been mentioned, were paired, the members of a pair being shown at the same or at following sessions; Slide No. 45(A) was followed at the end of the same session by 45(B), which, however, was exposed with right-left positions reversed from the (A) exposure, in addition to changes of secondary details; Slide No. 37(B) was shown inverted at first exposure, although 37(A), its duplicate mate, had been shown in the normal upright position; with Slides Nos. 23(A) and (B), beginning at focal point 2.0, (A) was alternated with (B) according to the schedule listed in Table 4, and the same shifts

<sup>34</sup> The inclusion of 2.5 between 2.0 and 3.0 brought the final number of focal steps to seven. This addition was made beginning with Slide No. 26, and continued thereafter for the balance of

the series, on the suspicion that at that particular point in the OF progression a difference of a whole mm between steps might overlook significant emergences.



were likewise applied to Slides 27(A) and (B). Slide No. 13 was inserted in such position that the numerals on the clock and writing on the sign post were reversed for the observer.

TABLE 4  
ORDER OF EXPOSURE FOR SLIDES NOS. 23(A)  
AND (B) AND 27(A) AND (B)

Focal point	Slide No. 23	Slide No. 27
0.0	A	A
1.0	A	A
2.0	A	A
2.0	B	B
2.5	(omitted)	B
2.5	(omitted)	A
3.0	B	A
3.0	A	B
3.5	A	B
3.5	B	A
4.0	B	A
4.0	A	B
4.5a	A	B
4.5b	B	A
4.5c	A	B
time	A	A

### 3. Reports

At the completion of each exposure, the observer dictated directly into the Ediphone a report of the perception stimulated by the exposure. There were no limits of time imposed upon the dictating, and the next exposure was withheld until the subject indicated a readiness to proceed.

Dictated rolls, upon completion, were labeled for transcription; and after transcription each roll was rerun for checking by the experimenter as many times as necessary to insure that the protocols were completely verbatim in content. The word-by-word accuracy of transcription was set and maintained as one of the basic requirements of the entire experimental design.

Running notes were also kept by the experimenter during each session to cover extemporaneous comments made

by the subjects aside from the dictated reports. These notes have been included with the protocols in the final analysis of the investigation.

### AN APPRAISAL OF THE METHODOLOGY

Certain features of the experimental design just described were not at all original with the present study. The tachistoscopic technique, for one, had already been acid-tested in many earlier researches, and the results of these had fairly clearly established the fact that fast-speed exposures may be expedient in the study of the perception of visual material.

Bartlett (2, 227), already referred to, secured his extensive body of data from exposures on a Hale tachistoscope averaging approximately .25 sec. each. Bridgen (6), for whom the short exposure method held out the advantage of stopping the perceptual process at intermediate stages, tried various times of 6 ms, 10 ms, 20 ms, 40 ms, and .2 sec., and located, for geometrical forms, the gross differentiation of outline and shape, without the addition of details, at 1 ms. Interestingly enough, Bridgen also reported that increases of time between .2 sec. and 2 sec. reduced, rather than increased, the clarity of perception.

Smith (97, 322-4), in particular, followed a procedure with the tachistoscope resembling in a number of respects the current study, presenting colored and black-and-white lantern slides of pictorial scenes to subjects who were instructed to report both subjective and objective reactions. Number of exposures ranged from five to one hundred on a single picture. Occasionally after the customary warning signal the picture did not follow but the subject was asked, instead, to report his preparatory reactions. Exposures were made with the

Hale tachistoscope at an average of 77 ms for adults and .2 sec. for children. The range for adult subjects was varied between 1 sec. and 8 ms (1/130 sec.). Smith (97, 327, 347) noted, in variations of time of exposure:

I modified the conditions of the experiments by cutting down the time of exposure to considerably less than one-hundredth of a second. But even with this very short exposure the immediateness of recognition was unchanged.

Although I did not use any quicker flash than one lasting 1/130 sec., yet even at that speed some subjects continued to see almost as much in the first flash as they had previously seen with the normal time of exposure.

The original work on figure-ground by Rubin had been executed at exposures of about 4 sec. (111, 200), and Wever suspected that even shorter times would be adequate for the figure-ground experience to occur. In his own series of investigations on the nature of the experience at various exposures, he arrived at the following times:

Less than 10ms—no figure experience; 10-13 ms—simplest figure experience; 15-20 ms—good figure experience; 25 or more ms—"perfect" figure experience.

Wever (111, 218-9, 221), too, like other experimenters, found that increases in exposure time did not necessarily insure increase in accuracy of perception:

In this series the stimuli were presented for much longer times, varying from a few seconds to more than 2 minutes, to test whether such extension would reveal any fundamental change in the course of the figure-ground-phenomenon.

This procedure revealed nothing new.

It is interesting to note that the "goodness" of the experience does not continue to increase with extension of the exposure-time.

One may conclude from the results of the last two series that increase of presentation-time, even as high as 30 sec., occasions no striking change in the figure-ground phenomenon.

There are numerous additional references to tachistoscopic usage for experimental purposes: Ehrenstein (17), whose speeds of exposure are not known, attempted to determine the duration of the exposure necessary for figure separation from ground and concluded that a variety of durations must be admitted, depending upon such factors as size, meaning, distance, etc.; Rogers (88) exposed ink blots in a range from .25 to .50 sec.; Freeman (21) used several different exposures, including 1.0 sec., 40 ms, and .5 sec.; Netschajeff (72) mentioned the use of minimal exposure times at first which were gradually lengthened until the observer reported the stimulus as seen; Dickinson (13) developed exposures at 64 ms; Carl (8) found that simple pictorial material could be generally recognized in exposures as brief as 27 ms.

From time to time objections have been registered against the tachistoscopic method of study. The rapidity of the flash, for example, is observed to lower the intensity of the effective illumination, and this decrease in lighting will continue to mount with increasing speeds of exposure. The restriction might conceivably be a strategic one—did not tachistoscopic performance proceed so effectively in spite of this condition.

The objection has not infrequently been offered that the speed of the tachistoscopic exposure must inevitably prohibit the adequate perception of the stimulus material. The evidence, however, is decidedly to the contrary, for the short-time exposure bears marks of in-

ducing, rather than eliminating, the perception of the total, in marked contradiction to the detailed analysis which is characteristic of much adult perception. Smith (97, 331) reports of one subject, "Once, when I changed the time of exposure from 1 sec. to  $1/13$  of a sec., a subject remarked: 'The picture was more of a whole then, without time to concentrate.'" It was very early brought to Wever's (111, 201) attention that "... a reduction of the time of presentation occasioned the dropping-out of some of the features of the figure-ground phenomenon known to be present in long exposures." Renshaw (85, 228) reasons this condition to be one of the advantages accruing in training via the tachistoscope:

For the attainment of the maximum skill in the visual perception of forms, wholes must be seen rather than a succession of discrete and disjointed parts. Brief exposure is one item in forcing the perceiver to see shapes coherently, unitarily.

And again:

Form thus becomes the name of an intricate perceptual process more fundamental than content. To train and develop it properly we must arrange all the conditions which are most favorable for it. Some of these are known. Many are unknown. When we restrict the time of exposure we not only initiate the trend toward unity and coherence in the pattern of the visual field but we bring the observer more and more to the point where he depends less and less upon the external conditions of impression in order to perceive. (82, 17).

Observers in the present study added to this impression that the short time may actually facilitate perception, rather than handicap it, because of the tendency of the flash exposure to force forms into more coherent relationships. Subject Ci explained, for example, that objects on short exposures often seemed shorter and thicker and closer together

than at time but that their "component relationships" remained constant and hence there was no interference with their recognition. The amount of material reportable at a rate of 2.5 ms is attested to upon inspection of the present protocols, and the quality of the reports is even further demonstrated upon comparison with the reports at time exposure.

Koffka (55, 141) once remarked on the efficacy of the short-time exposure for reducing the strength of external conditions, and nowhere is this better demonstrated than in the development of phenomenal time which the tachistoscopic procedure promotes. With very rapid adjustment the observer appropriates the experimental time conditions to the status of an experiential order, and remarkable time changes in the experimental situation are accommodated by the observer as though they were constant. Smith (97, 327) reports:

Subjects were usually unconscious of any change in the speed of the flash in the cases where I secretly altered it from the normal to the very rapid time. They often reported, however, that the picture had become "very dull" and conversely, when the duration of exposure was lengthened, they would remark that the picture had become "much brighter."

The observers in the current investigation gave recurring evidence of the phenomenal character of the exposure span. There were numerous questions, once the runs got underway, about the amount of time increase on each successively clearer focal point. The information that the speeds remained constant for all foci continually brought surprise and amazement. As Subject Hi remarked, the comparative ease of catching the later steps implied that they must be longer in exposure.

There were evidences, again, in the session with Slides No. 17-22, in which



only clear focal point 4.5 was used from the beginning. Almost unanimously came comments from the subjects that the four repetitions which followed the first exposure were of surprisingly little aid in adding to the first perception, and some observers even expressed frustration and consternation at being confronted with material with which they made so little additional progress. This was often the story, also, in the OF-IF series, when the clear point 4.5 had been reached and one or two repetitions were added without producing any substantial changes. Evidently the physical addition of time in the repeated exposures does not necessarily produce corresponding increases of a phenomenal sort. Were mere addition of time the sufficient condition for perceptual completeness, then observers who are systematically given to analysis of detail should be able, upon repeated exposure, to improve perceptual performance. Bartlett (2, 246), however, submitted that they gave no more accurate reports than any others; and Smith (97, 329) found that this type of observer "... usually reported that the pictures gradually lost their unity and became mere collections of parts." "The same effect," he continued, "was produced when I showed pictures to some subjects with an exposure of 2 or 3 secs." There is a corresponding significance in Renshaw's (80, No. 1, 4) statement that "The persistence of certain types of errors upon repeated exposures indicates that more sensory impression alone is not a sufficient corrective."

The earliest defense of the short-exposure method, i.e., the prevention of eye movements (21, 350), was diverted to something of a question by Bartlett (2, 245-6), who indicated that the method ... does not put a subject into anything

like a normal situation. We do not commonly have to make out complex pictures or scenes by a series of flashes. . . . It does not seem safe to say that the flashing up and out of a scene can give a result at all comparable to the continued observation of that scene, even when that observation passes from detail to detail.

Yet there is evidence, on the other hand, that normal perceptive activity may proceed precisely in the manner which Bartlett ascribed to the short-exposure technique. Vernon (99, 93-4), in recognition of the fact that figure emergence for complex stimuli is more difficult of apprehension tachistoscopically than the Wever or Rubin figures, still proffers this explanation:

The contour of each part of the picture may be clear enough, but it is extremely difficult to find the exact limit of the part of it which is "figure" and the part which is "ground." So too in the percepts of normal everyday life. The only explanation seems to be that at any one instant of time the field is segregated into a well-defined "figure" and "ground," but that constant shifts of awareness produce a ceaseless fluctuation of the "figure" and "ground" from one part of the picture to another. . . . [Thus] it appears far more justifiable to posit the existence, except under artificially circumscribed experimental conditions, of an infinite number of levels gradually shading into one another.

Judd and Cowling (51, 356), in a series of studies on perceptual development, arrived at a similar conclusion:

The various lapses and slight improvements in the last five drawings show very clearly why there is so little improvement in our ordinary perception of complex figures. Attention is from moment to moment fastened upon this or that detail of the figure and there is a corresponding withdrawal of attention from some other part. The complete mastery of all the details is therefore a long process. In most ordinary experiences the interval between observations is so long that the lapses more than make up for the periods of improvement and so we have

merely crude approximations to complete and correct percepts.

This apparently characteristic procedure of everyday perception, then, is merely simulated in the short exposures, for, as Renshaw (82, 25) has pointed out: "Psychologically all tachistoscopic exposures above a certain very low temporal limit are *successive exposures*."

It would not be surprising if the judgment were proposed that subjects in the present investigation, by virtue of the speed of exposure, actually reported from after- or memory images (26), and that these are not to be construed as reports on perception. Only two of the observers, Subjects Da and Ta, mentioned any conspicuous persistence of after-images during the course of the experiment. Subject Da reported a customary habit of after-image intensity, which manifested itself in the current instance sometimes as long as an estimated  $1\frac{1}{2}$  sec. Subject Ta had had considerable recent experience in the experimental inducement of after-images and was particularly susceptible at the time to their activity. Once the two observers were recognized as experiencing much imagery, subsequent flashes were withheld until they reported readiness to proceed. It should be noted in passing, however, that the length of the Ediphone reports at any focal point practically eliminated the possibility that an after-image would very often have carried over into a succeeding perception. Subject Ta's imagery, as a matter of fact, was once mentioned by her as being an assistance in carrying over forms from one exposure to the next, which strongly suggests a memory, rather than an after-image.

Judd and Cowling (51, 357) would defend the memory applications, even in

the study of perception: "The tests should not be criticized because they involve memory, it should rather be recognized that all perception involves memory, the memory phase being in general overlooked by any purely analytical method of examining experience." Memory is not infrequently referred to as extended perception; and it might very well be added that the fact of perceptual independence from much direct sensation strongly implies that perception is likewise an extension of memory.

None of the arguments against the tachistoscopic procedure has proved valid in the face of the operational criteria, and one of the most forceful aspects of the rationale for short exposure is the attitudinal tone which it arouses in the observer. By its very nature, if the observer is able to cope with it, it forces the transformation of passive receptivity into active participation. Smith (97, 321) found that each of these attitudes brought different perceptual reports; and Koffka (55, 173), after reviewing the evidence, offers that "These examples suggest the following kind of conclusion: when the organism is active, at a high degree of vigilance, it will produce good articulation; when it is passive, in a state of low vigilance, it will produce uniformity." Bartlett (2, 227), (in virtual contradiction of an earlier statement against the short-time method) was led to admit that the set which it elicits justifies its experimental usage:

... it must be remembered that the ordinary glance of everyday life does not rest long on any given object, and also that the attitude of the subject in experiments in which he is definitely set to observe and to respond is far more keen and critical than it is ordinarily. A short exposure may therefore help to get near to everyday conditions.

McGeoch (67, 505, footnote), parentheti-

cally, saw in set an element of the rank of a specific experimental variable:

If one adopts a view of set which regards it as primarily muscular in character, it reduces to proprioceptive stimulation. A change of set then becomes the same as changed stimulating conditions. This interpretation further unifies the concepts involved in a psychological interpretation of forgetting, but its validity is still uncertain. The probability that altered set and altered symbolic context may often amount to the same thing is also another step toward the unification of fundamental concepts.

There can be little rejoinder, actually, for ignoring the obligation of the experimenter in controlling the quantity and quality of attitude which may be elicited, and the tachistoscopic procedure, without doubt, is particularly effective in deriving such a set.

It may be of significance, in passing, to comment that the warning tendered by Köhler and Wallach (61, 348-9) on the pollution of experimental results in perception by conditions of satiety seems particularly well heeded with sufficiently spaced tachistoscopic exposures.

The use of the OF-IF progression of exposures is much more singular to the present study than the short-exposure methodology. Nothing is known in the literature which duplicates it more closely than studies similar to Gottschaldt's (18, 125-6) threshold experiments with emerging figures. As constant focus was made on the projection screen, an episcotister exposed geometrical figures through an opening which gradually and automatically increased during rotation. Under such an arrangement there was a requirement of 40-60 sec. for the figures to become fully visible. Kollig's (62) more recent attempt at gradual development of a clear impression employed variations of light intensity by means of rheostats.

Bartlett (2, 262) had earlier deplored the fact that the studies to date had only been able to tap perceptual processes in mid-course; that, in fact, the mere naming which identified the perception meant that synthesis had preceded which had eluded the vigilance of the experimenter. And while flash techniques had in principle been supposedly elongating the process for observation, they had been perpetuating this same deficiency, regardless of early or late identification. There had been cries, also, of the urgency to observe perception in terms of its genetic sequence (51, 350; 99, 214-5).

The OF-IF procedure seemed to fulfill many requirements for which need had been expressed. It utilized not only the phenomenological procedure of Gestalt, but it also isolated experimental conditions to such extent that what was left for phenomenological report was at least partially under control of the experimenter. If, as Koffka (55, 73) lamented, the baby had been thrown out with the bath by the objectivists, it was hoped that the baby might at last be rescued and re-established in a more tolerable setting.

To the possible objection that the OF-IF series was not actually a series, after all, and that each exposure, by the very fact of new focus, was a *different* picture, it is to be pointed out that there was no need for a sequence of identical stimuli. All that was required—and that statement is made advisedly in full knowledge of the difficulty of accomplishing it—was a sequence of levels or progressions of clarity of perceptual activity which could be described and measured; and the protocols amply verify the fact that this criterion was met. In his work with the figure-ground phenomenon, Wever (111, 226) discerned this level-to-level



contribution to which the whole adheres:

The nature of the experience of figure and ground depends upon many things. An analysis may be effected by variation of one phase of the situation while other conditions are constant. . . . It is the whole correlated series that is to be regarded as the *figure-ground phenomenon*. A given figure-ground experience, then, is but one of many possible stages of the complex perceptual phenomenon, and its precise nature is a function of the various components of the situation in their entirety.

As a matter of course, it is actually surprising that observers maintained as much relatedness between levels as they did, and that fact may be introduced to substantiate in one more way the phenomenal adjustments to which observers subject the sensory material of the environment. An error in the focusing of Slide No. 5 for Subject Fu, in which focal point 2.0 preceded 1.0, brought the report, nonetheless, that the second step appeared clearer! Very characteristic were comments from many

subjects that even the "fuzzy" shapes of the OF levels were soon utilized as cues of position, form, and size for later identification. There were evidences, indeed, that even the earliest stages provoked much effort after "something" to which the observer could become attached for the remaining developmental sequence.

It may be countered, in concluding, that normal everyday perception is a full-blown activity, and that the resultant act is no more identical with any one developmental phase than any emergent is akin to the segregated qualities from which it is compounded. Let the author of that objection recall that our problem is not a description of everyday perceptions but a probe for the minimal and transitional levels which have laid such foundations that the perceptions of everyday experience can arise upon them. About these the OF-IF method seems to have revealed a great deal, as the next chapters will attempt to demonstrate.

## CHAPTER V

### ANALYSIS OF RESULTS: THE COURSE OF THE PERCEPTUAL PROCESS

THE types of protocols which were produced by the experimentation just described would have permitted either a quantitative or a qualitative evaluation. That the qualitative was chosen in preference to the former bespeaks the judgment that it was more amenable to the needs of the present problem. While there might, for example, have been interesting observations to be gained from a location of the median foci for certain emerging factors, such information seemed hardly *à propos* when the question at hand was one of processes in time, not specific points, and of relative, not absolute, conditions. In fact, a transitional or emergent level for one subject at focal point 3.5, if preceded and followed by circumstances similar to those found in another subject with the same emergent at focal point 2.5, might connote significance in a qualitative approach which would escape almost entirely the statistician operating on a quantitative basis. Besides, there is some argument to be voiced against insisting on any real distinction between the two viewpoints. Koffka (55, 14, 15) took the stand that neither could ultimately exclude the other:

The misunderstanding arises when one considers only the individual facts with their measured quantities, overlooking the manner of their distribution. But the latter is no less factual than the former, and it indicates a property or quality of the condition or process under discussion.

And we can now draw a lesson for our psychology: it may be perfectly quantitative without losing its character as a qualitative science, and on the other hand, . . . it may be unblushingly qualitative, knowing that if its qualitative descriptions are correct, it will sometime be possible to translate them into quantitative terms.

A running inspection of all the protocols was undertaken at the beginning of the analysis, to gain some indication of the direction for subsequent steps. Even at this very early stage, several conditions became readily conspicuous:

(1) An almost amazing consistency appeared, both within individual subjects and from one subject to another, in the order in which perceptual development took place. From this fact it was deduced almost at once that the pursuit of similarities, and not individual deviations, should probably be the strategy of the analytical procedure. One is reminded at this point, of course, of Child's (10, 3) basic question, "Of what do the similarities of pattern in development consist?"; and of Weiss's (106, 105) prediction that "Any regularity, similarity, correspondence, or other connection among individual phenomena . . . hides a problem."

(2) The OF-IF procedure did not produce, as was to be expected, a *continuous* or *natural* sequence. Each point of report, because it involved a new focus, introduced a new set of conditions with which the subject must contend in evolving a describable perception. Thus, the change in light intensities, locations of areas of concentration, and form distributions from foci to foci may have produced what appears at times as regression instead of successive progress. What was more important, however, for the present study was not the fact of regression as such, but the condition which was sufficient to provoke regression; or, on the other hand, not the fact that progress was achieved, but the condition which was required before progress could result. Indeed, it seemed reasonable that if

these circumstances were once ascertained, the natural sequence could then be construed by induction. For the purpose of that type of approach, the protocols seemed admirably adapted to analysis.

(3) Not all the slides revealed to equal extent the expanding perceptual process. Even in the OF-IF method, particular slides like Nos. 2, 13, 27(B), 36(A), 37(B), 44, and 51 disclosed such early cues to form that identification came rapidly, with the consequence that the completed process was reported too spontaneously for much value in analysis. Other slides, however, which were more loosely structured even into time exposure, stretched out the developing process to web-thin consistency, exposing unexpected factors and their functions in the progressive sequence. Some of the best of these were Nos. 6, 7, 10, 14, v14,<sup>35</sup> 16, 24, 26, 33, 43, 46, 48, and 49. Apparently in these cases the OF-IF effects were augmented by the characteristics of the slides themselves. Since form identification appears to climax the consummation of the perceptual process, the longer the stimulus material can retain the sensory stage and delay the admission of other aspects leading to identification, obviously the more of the transitional process will be open to observation. In view of this situation, some selection and rejection of material seemed entirely warranted in making the final analysis.

There were qualitative distinctions of another sort apparent among the slides. Material which had originally been included for a special purpose, it became evident, was not always compliant in exciting the results expected. This applied particularly to the group of slides

selected as potential stimuli for the Rorschach human movement factor. A precocious discovery in even the cursory inspection was the fact that by the time movement evolved in the slides which suggested it at time exposure, the developmental conditions which had precipitated it might have been lost by telescoping with other conditions. On the other hand, there were abundant reports of movement in OF points where no amount of perusal of the sensory data at prolonged exposure would have warranted such a report. Evidently the genesis of movement was to be searched for in the latter situations, and not in the predetermined group of slides.

What is believed to be a representative group of these more strategic slides, then, is reproduced in full from the verbatim protocols. A perspective based on all of these records will first summarize the general character of the data; and an eventual breakdown under more detailed sub-topics will later provide the core for our specific findings.

#### PROTOCOL I

*Subject Ya*

*Slide No. 6*

- 0.0<sup>36</sup> This exposure shows a rather dim flash of light toward the top, with a strip of unlit area in the middle and then a still dimmer and more diffused light toward the bottom of the picture.
- 1.0 The same impression as before, with the light at the top growing brighter and the light area at the bottom stretching out more toward the side, becoming a—almost a strip of light along the bottom of the picture.
- 2.0 In this exposure I was unable to see anything other than in the previous exposure.
- 3.0 In this, the top light has become diffused and has gone over toward the edge of the picture, so that the corners are now more eliminated—are more

<sup>35</sup> Slide numbers preceded by a "v" indicate exposures made in inverted position.

<sup>36</sup> Focal point.

illuminated (laughs) than they were.

3-5 Here, one definitely gets the impression of the—of a sky, either at a sunset or sunrise, with clouds—with the sun shining through the clouds, thus getting a sort of diffused light of the sun through dark streaks which show considerable shading, horizontal strata of clouds with the sun behind them, possibly at the bottom being reflected from a bright object such as a body of water.

4-0 This exposure, I would be unable to add anything to the observations of the previous one.

4-5a This definitely appears to be a landscape with a cloudy sky and the sun at about 3 o'clock angle, apparently. Vague impression of a road and fields, with the sun's rays being diffused on it in—in a dull sort of way through the cloudy sky. Apparently the light which I observed at the bottom and had previously thought a reflection may be a roadway or something of the sort in this landscape.

4-5b At this point I think I'm looking at a seascape again, as before, rather than a landscape, with the water rather rough, but still the cloudy sky and the sun only partially shining through it in spots, light being diffused otherwise. There is a dark line in the water which looks as if it might be a pier, or breakwater, or something of that sort.

4-5c Again this is a—would seem to be a marine seascape, though the pier has disappeared from this particular view, and one gets an impression of a point of land jutting out into the water which is rough, which is reflecting some sunlight, and the filtered sunlight is showing through the clouds in the sky.

time Well, I'll be damned! This is a landscape with a very diffused light from the sun illuminating the landscape. The sun is hidden behind the clouds and is filtering its light through them. There is a light body of clouds toward the center of the picture, with the clouds definitely darkening as the horizon is approached. As a result, the background of the horizon is quite dark, and it can only be dimly perceived. The entire layout of this landscape reminds me of two possibilities. I would

say, first, that it more than likely is an area of farm in a rather broad valley. Terrain is slightly rolling, with the plant portions very carefully cultivated. One can see what might be the outlines of fields with differing crops occupying three major areas in the picture, the background slightly to right of center, and then, at about the same distance in the background, a small area to the left. On the other hand, the area to the left just mentioned as possibly being a farm seems to show some buildings which might conceivably, then, be a community. There is also the possibility of a community's appearing at the right edge of the flat area mentioned before, just to the right of center in the background. One can see three roads in this picture, each of them tree-lined, which makes them stand out very much. If it were not for those roads, one might suspect that this could be an army air installation—or an army or navy air installation, with the land carefully levelled for fields, and there are some buildings which might be hangars in the front ground. However, one would doubt that this would be an air installation with trees outlining the roads so carefully and clearly as they do here. In the lower left-hand corner, we can see a clump of vegetation, which makes it quite clear that this picture is taken from a hill overlooking the lower level. There is also some—also some strips of vegetation further on down the hill on something which, in general, looks like Scotch broom, though not in bloom.

#### PROTOCOL II

Subject Da

Slide No. 7

0.0 The concept of darkness, which was spread almost uniformly across the screen, with perhaps centralization from the upper—the lower to the upper order, so that it's a sort of cut-off triangle.

1.0 This time the dark spot seems to be over to the right and very hazily so, so that the color intensity is almost similar throughout the screen area.

2.0 This time the dark spot has elongated,



so that it seems to be almost parallel to the right-hand side—right-hand border, and extends toward the center. The demarcation, however, is less obvious in the center than it is over at the right-hand side.

- 3.0 Here the darkness again has become even longer, coming up almost out of the screen. And I'm conscious of variations in light down on the left-hand lower corner.
- 3.5 This time, also a border along the lower edge of the picture, so that the dark shapes are—just have two borders at the right side and bottom. It looks a little bit like the view—airplane view of a rowboat, but not taken at quite—directly above, but at an angle.
- 4.0 This time I—I get the impression of some sort of wheat or grain field, with a very small horizon at the top and a very thick type of growing wheat or grain that has rather large heads on it, ends of—on the—ends of—the growing material, so that they catch the light. They're little globs of light.
- 4.5a Again, same impression. Probably the field seems farther away than it did before, so that these heads—grain heads appear smaller than usually. And there may be some sort of bordering of this field, perhaps a road or a hedge, or a distant landscape, at the upper end of the field.
- 4.5b The field near the upper border is lighter, probably because of these heads being closer together, but I am pretty sure of a darker border. Whether it's trees or perhaps distant mountains, I'm not sure. Above that is the light.
- 4.5c Almost the same impression as before. Again, this contrast of a light streak and then a dark streak in the upper end of the field.
- time This—when I first saw this, I thought it was water, with a buoy in the distance, but I see that it's a—a man in the distance, walking with some sort of farm implement, probably, over his shoulder. I'm still not sure of the foreground. It may be some type of grain, but I rather doubt it, unless the focus is—is off. What it reminds me of is a silt which has been left by water. It's interesting to see how I

exaggerated this light and dark streak that I mentioned in the background before, thinking that one was a border of trees or mountains. I still have the impression of water, because the long, wiggly shapes could be silt—edges of clods of this clay; but why would we have the sort of small, circular-like spots which are in groups of—oh, three or four? Because certainly that would correspond more to the reflection of water. And—what it may be is looking in from the—just off the edge of the shore-line, and the man is on the beach—the white sand, with this dark in the background. However, if it is water, how would we explain these long, wiggly things? They may be reflections of ripples. I have seen that at the beach when the . . . come in for feeding and they ripple up the water and disturb it. . . . But you never see such a big school as here, and you don't see water breaking on a beach like that. Would be a wave breaking. Yet there does seem to be a difference in the texture of the foreground and background. And why get these different shades? One in the low left, middle center, etc., that might be water reflections.

#### PROTOCOL III

##### Subject Ga

##### Slide No. 7

- 0.0 This seemed to be just a—nothing but grey light, with the general shading about the same. However, the outline of the light seemed to be just in the reverse of the previous flashes, with the longest portion of the flash going from top to bottom rather than from right to left.
- 1.0 This still seems to be just a flash of light. However, it's somewhat wider than it was before, but there's no definite outlines other than just this general over-all shadow—or rather subdued light.
- 2.0 This flash still seems to be just sort of a dull grey light, with sort of a rippling effect at the bottom part of the flash, sort of on the general appearance of ice that might form at the bottom of a glacier with unusual pattern to it.
- 3.0 This light still seemed to be rather a

dull grey. But now, the shadows are assuming more shape. At first glance, it seems to be possibly a field or an area of land just overgrown with grass, such as marshlands along the side of the ocean or a river.

- 3.5 This flash is still somewhat more pronounced than the previous one, with the general feeling being one of possibly water or land of some sort showing off in the distance, which would be represented by the lighter portion of the picture, and then the portion this side of the—rather the front part of the picture assumes the characteristic of flowing grass, or general growth of weeds and grass material that might still be a sort of a marshland.
- 4.0 This shady material is still more pronounced, now taking on somewhat the shape of a field, with possibly some sort of a crop growing in it. The white lines going through it seem to be somewhat forming a pattern, but not assuming any definite outline yet. The whole feeling seems to be one of looking through a scene that—with cut-glass somewhat distorting the picture.
- 4.5a This looked more like the lowlands, with the earth being cut up into very small streams of water, all of which seemed to be flowing either away from or towards the center portion of the picture, sort of general feeling of what might be—such as one might expect, for instance, at the mouth of the Mississippi River, where the land is—rather the river has built up the land from the silt coming down from the water, and then we have tiny rivulets of water represented in this picture, going all through it.
- 4.5b This still seems to have the general accent of lowlands within the dark land, with rivulets of water running to it. However, the—the pattern seems to be a little too definite, and it might be some sort of a piece of material with a pattern showing, or light shining through it.
- 4.5c The outline is still not very much more distinct than before, but one got the impression that it's still an outdoor scene, with a field or a land of some sort interspersed by white lines, as-

suming a rather regular shape, and off in the distance was apparently some trees or a cloud formation.

- time This is an outdoor scene, with a man, apparently carrying a shovel, in the distance. It is rather difficult to determine whether this is water in the foreground of the picture, or sand that is not yet dry, or possibly mud. The light shining on it gives it a wiggling shape in regard to its shadows and—which would indicate that there is definitely moisture there, and there's probably water that has sort of settled down between the furrows of—of the land, along the seashore. Sort of a general appearance that one would expect where the tide is gone out and left the seashore uncovered with—The sun seems to be shining down rather brightly, and some dark spots are in the picture, possibly stones. The whole general appearance of the picture seems to be one of the land's sloping towards the front part of the picture, with the higher land in the back. There are no objects that are apparent on it, or in the way of buildings or anything other than a single solitary—or rather a solitary individual, in the—towards the center of the picture, who apparently is walking along and carrying an object that looks like a shovel. This would indicate possibly that this man had been digging clams while the tide was out. The back part of the picture shows sort of a grey cloud on beyond the horizon. The portion where the man is walking assumes the shape of being sort of a levee, or at least it is considerably—somewhat higher than the land surrounding it. It seems to come up into the form of a bank.

#### PROTOCOL IV

Subject Ga

Slide No. 10

- 0.0 This flash was just—apparently just a flash of light with no sharp outlines, sort of an oval shape and vertical in position. The light was not brilliant, just sort of a general all-over hazy light, with possibly somewhat more brilliance to the light appearing on

the right and lower portions of the flash.

- 1.0 This light was still somewhat changed now, with a brighter portion of the light showing in the right bottom portion, and then the left center portion showing through with some light and some shadows interspersed throughout the upper part of the flash. These shadows were not any particular, definite shape, but the general appearance would be sort of that of a cavern, looking into it from the outside.
- 2.0 The shadows are somewhat more pronounced than before, and it—it's sort of mixed up. No definite distinguishable outline is noticeable. The general appearance of the lighted shadows would be that of looking through a microscope and sort of looking at a general picture of a bacteria or some other specimen.
- 3.0 The shadows still are vague, but assuming some more definite shape than previously. The over-all shape of the flash is oval, the brighter portions of the light shining in on the right of the center of the picture, the darker shaded areas still not forming a pronounced shape but giving the general aspect of looking into a sort of—some sort of a piece of round glass that would be rough with the light shining through, forming a rather grotesque outline.
- 3.5 The shaded portions are more pronounced, now, but still cannot discern any particular shape to them. Seem to be just sort of a conglomeration of lights and shadows—the same general shape as before, more or less on the order of a surrealist painting in black and white, with dimly highlights coming out into the picture.
- 4.0 The general impression, at first, is one of a sort of a hub in this, possibly from an automobile, with the tire off of it showing the rim, and the whole thing being on sort of an axle protruding from another wheel that's in the background of the picture. The highlights on the picture indicate that the light is coming in from the right, and there is some sort of a round hub on this projection. However, the hub seemed

to be pretty wide for a tire rim. It looked like it could be possibly, however, a rim for a tire that might be used on a large airplane where you have a large size tire but a small hub to it.

- 4.5a This general appearance seems to be, now, possibly the front of a camera or some sort of a device similar to it, because there were nails or rivets showing around the bottom portion that were highlighted, and it looked as if it was sort of a lens that might be on the front part of a camera.
- 4.5b It still gives the appearance of being the lens on a camera, with possibly some sort of a button on the left of it, and on the bottom portion of it shows the beginning part of it, with some sort of rivets holding the thing in place, and then there's sort of a telescopic effect to the projection coming out from the back part of it, with possibly the lens in the background. However, I was not able to discern whether the glass lens was actually visible, but it—one would expect it to be there, since it is apparently the portion—front view of a camera lens.
- 4.5c It still assumes the aspect of being the lens of a camera, with definitely the lens showing in the center portion of the picture, and the material of the whole thing being sort of a metal or a plastic of some sort as—the whole—being a black and white photograph of the lens. There is a sort of a projection or button on the left, indicating a part of the contrivance. On the bottom portion of the picture there's still the row of rivets or brass buttons of some sort that would indicate that it is fastened onto another piece of material.
- time That's what the darn thing is! This flash is a front view of a camera, showing the lens and the shutter arrangement in the background. The lens apparently is concave, with the shadows reflected in it being sort of curved, and the shadows indicate that there might be a row of windows directly opposite this camera that are reflected in the lens. On the outer portion of the lens—the shell surrounding it, there are



some letters, indicating that it—the camera was made in Paris and it's a number,—“1-4-1-8,” possibly “3-2 Anti-stigmatic Del”—“Dellor” type, with a “4-5,” and then an “F,” with an “equals” sign, followed by a “3-1-0,” which would probably indicate the type of lens enlargement or speed of the camera in some way. And then on around this circle of material that holds the lens is the—also the letters “Hermann”—or the word “Hermann.” This shell holding the lens probably is of a plastic material, since it is black and the letters on it are printed in white. On the bottom part of the picture, there's sort of a sliding arrangement of metals that permits the opening to be made larger or smaller, according to manipulation of the device. They curve around—these slips of metal, and—which would indicate that they slide, and in the process of doing that will make the opening larger or smaller. And this part of the camera is held in place by a band of metal that has rivets in it. From the picture there are eight rivets showing. There's possibly a ninth one just underneath the shell holding the lens. In the upper part of the picture are three rivets showing as a part of this larger shell in which one would expect to find the main part of the body of the camera. This shell seemingly is made out of some sort of a light colored metal, and it has a thin rippled band of metal around it, and the band of metal of the whole shell is probably half an inch, or a quarter of an inch wide. And then on the inside of it would be those sliding pieces of metal that are circular in their contour, which in turn fit in next to the neck of the camera holding the lens. I judge this lens to be probably in the neighborhood of an inch and a half to two inches in diameter, and it seemingly has a very high polish to it, from the reflections showing in the lens.

#### PROTOCOL V

Subject Fu

Slide No. v14

0.0 There just seemed to be an oval of

white running from left to right. The whole light place on the screen seemed rather small.

- 1.0 This time the light part seemed brighter in the center and then seemed to fade out toward the edges, and the outline of the whole area seemed to be a rectangle, with the long part running from left to right and the width being from the top to bottom.
- 2.0 This time there seemed to be dark parts in the left and in the right sides, and then around the edge on the left-hand side, it seemed like the edges of a star. There was one point on the star up toward the left-hand side and then one down towards the left-hand corner, and then I had the same feeling there were points to the star over on the right-hand side. Now they're jagged edges because there were just—I think about four of them, and they weren't running right one into the other.
- 2.5 This time the outline seemed like a rectangle, but the star itself was inside the—the inner edge of this star being the light part and the edge between the edge of the rectangle and star effect being darker and—In the center of this star affair there were—I could see more dark places this time, but I couldn't figure out what they were.
- 3.0 This time I could see a—oh, more of —oh, the effect of—oh, sort of a shimmering effect in the middle part. There was a light and dark, and there was sort of long line running from left to right—I mean, not straight—oh, I'd say, like when I looked at them from here, they looked about a quarter of an inch on the screen.
- 3.5 Just sort of shimmering, and as though you were looking at a—at a—some kind of jell, and you would put—oh, bacteria in, or something like that. And—then around this I could see the dark more clearly. This dark wasn't . . . either. It had darker spots in it, though these weren't as distinct from the lighter part as it is in the center of the picture.
- 4.0 This time the picture is more divided. In towards the center there is—oh, not a star, because it seems to have six points on it, but on the outer edge

of this there's a—on the left-hand side—it looks almost like fur, and dark and light. And then—the right-hand part was darker than the center, too, but I couldn't make out exactly what it was. I wish I could explain what I mean. I'll watch this time and see if I can remember it.

4-5a (Drew) This time it looked quite different. There seemed to be a—oh, a rock affair in front of what looked to be the shadows of three people. These people looked quite small, and you couldn't see all their bodies. And—oh, it sort of looks like there was something overhanging behind where this fur. . . . The picture itself looked like quite far away. It didn't look like a close-up.

4-5b This time, in the foreground there seemed to be leaves or shrubbery of some sort—rather lacy shrubbery, and with a few points to the leaves sticking out so you can see the outline of them. And then, right above this, a little left of center, there was a—oh, a darker part in this—it—I mean, it didn't look solid or anything, but the picture—it just seemed to have—well, it seemed to have a rounded shape—with rounded corners, but more the shape of a rectangle.

4-5c Well, on the—little right of center it seems quite a bit darker, and it almost looks like there's a figure of some sort against the white background, or the whole picture looks as though it might be—oh, not a still-life, but a picture of a garden or something like that, very close up, so that you would see more of a design like you would have on—oh, on material or something like that—a painting that would be very close to whatever you were doing. The whole picture's rather hard to describe because—well, I don't feel that I can exactly say how I see the lines—I mean, I can just see them in my mind, but I'm—it's hard to describe where that is.

time This looks like a close-up picture of snow. And it looks like a place where there's a hole sort of under this snow, or else it could be a picture that was quite far away, and you could see the—the thing that makes me feel that it's closer rather than being far away is

the way the snow on the top part looked. It looked—well, the way snow does when you're—you're very close to it. It—the way the figures and raised parts are in the snow is—gives me more the feeling that it's close, and it's very . . . white. If you were far away, you'd have to be farther away than this picture looks, because the raised parts are too small in proportion to the rest of the picture. The raised . . . affair, or a place where it's been cut out is—starts from a most—very small cut-in on the left-hand side about halfway above center and gradually becomes wider as it comes towards the right. However, it's not just a plain—oh, even side hole or—I mean, it might be, but there—there are things in the foreground which interfere with being able to see it—this—see it completely—oh, in the form of a triangle over with the top part, with the longest edge of the triangle being on the top and running almost over to the center. This isn't cleared space, but you can see in and see the side. But, right in the center, starting from the bottom and working up, there's sort of a central effect of—oh, sort of, of leaves, or twigs, or something like that that has snow very—quite thick on it. You can see a few bare little twigs sticking out, but that's about all. The snow looks very heavy and wet. And this—there's—this is rather wide at the bottom, and then it sort of tapers in towards the top and—well, there's just one piece that makes contact with this over—edge of snow. Then, at the right-hand side there are—you can see quite a few—oh, leaves and—like with snow on them. And then there's one—well, it depends on—it looks like it might be a—a piece of wood, or if the picture is taken very close, as though it might be a stalk of something with snow on it, the snow being heaviest on the left-hand side, as I look at it. And that's where the snow seems to come from in all places—from the left, because it's heavier on it—that is, on that side. And this has some—oh, pieces sticking out to the side, perhaps leaves, most of these being nearer—nearer the bottom. And then, as you work over

to—from the center to the left, there's quite a dark space that comes up—oh, and—comes in a—a sort of rounded shape. I think maybe I could draw it better than anything else. (Drew) And then there's just one little—oh, a sort of blotch of white, no whiter than the others, but where the light had struck it . . . so it makes it look light. And then in the back there's sort of a greyish—the snow looks rather grey from being in the shadow. And among—in—in among the snow is—I mean, are—some leaves and twigs and like that. And the whole picture looks as though the light is coming from the left, and it makes—quite pretty lights and darks, especially—And it also makes rather a pattern on this upper ledge of snow—this overhanging ledge of snow. I can see now where I got my first impression that it was sort of a cave affair. And it—the white leave part in the front looked—in itself looked like stone or something, as though it might—This very light part that goes up in the center is divided into almost three parts in the part that's closest to this overhanging ledge, which was what made me think of three people. And then the snow itself is overhanging, which gave the effect of a cave.

#### PROTOCOL VI

Subject Hi

Slide No. v14

- 0.0 I only noticed that it was rather small and in an oval shape.
- 1.0 This time it is much larger. However, I didn't see any object on the flash. It was mostly a grey. Toward the top it appeared to be lighter.
- 2.0 I noticed two dark spots in the center. Seem to be some sort of a design. Also lines running from that. All I saw was this one object surrounded with a dark—rather a dark grey blur.
- 3.0 This time the object appeared to be at most of the area of light—take most of the space in the slide. It appeared to be some design similar to a butterfly—in that general shape, and had black spots over it.
- 3.5 It was a little clearer this time. However, it still gapped. It seems to be

possibly an animal. It gave the impression that it might be a head of a dog, such as a Scottie. Then, towards the right, there seemed to be the head part. Seemed to be a hairy object of some sort. (Later) I believe that's the only object in the picture—this one furry-like object.

- 4.0 This time it appeared to be like a spider web. However, I can't distinguish exactly what the object is. That gives me that impression.
- 4.5a It was a little sharper this time, and I believe it might be a scenery, now. It might be trees and a cliff in the background, with rocky substance on the hill or cliff part.
- 4.5b I saw it pretty clearly this time, but I can't exactly decide what it is. It seems to be some fungus growth—something like that. It's rather smooth, but the ends have little lines running out, maybe some sea plant under water.
- 4.5c It was even sharper this time, but I still can't exactly figure out what it is. There's a lot of growth there of some sort, possibly shrubbery, and maybe rocks thrown in. It may be a plant.
- time (Turning head on side, then upside down) This is a long exposure of it, and I still can't exactly make it out. Seems to be a composition of several pictures. Part of the picture are trees with snow on it, and the top part seems to be another picture put onto this one which before was a road to the scene covered with snow and tracks made in it. I have an idea that I've seen part of this picture before. Wait, it is upside down! This picture is one I've seen before, a snow scene, and it's reversed or upside down, and it is one picture instead of a composite picture. A snow scene on a hill. Trees covered with snow and rather like a mountain in the background, covered with snow, also.

#### PROTOCOL VII

Subject Li

Slide No. v14

- 0.0 Grey vertical streaks. In the lower left center there is a—a humplike affair.
- 1.0 Same thing, only this hump has grown larger.



- 2.0 Some spots have just grown larger and darker, and the hump has grown broader.
- 3.0 The patches have grown more homogeneous, so it's almost a solid grey. And this one hump still stands out predominantly.
- 3.5 It's as though you were looking at a sky full of clouds. They could be either lightning flashing through, giving streaks, or it could be that the clouds have splits in them . . . through them to the sky.
- 4.0 There's a feeling that—that this couldn't quite actually be clouds. And then, again, there is another feeling about the whole thing, as though it might be more gritty or crumbly than clouds, which would mean—in other words, it would be more like the side of a mountain, or a . . .
- 4.5a It seems to be a scene of a lot of undergrowth and tangled brush—large rocks, sort of. Not too much light, and yet intermediate between light and the . . .
- 4.5b Would appear to be a pictorial scene in which you have, in the background, mountains with some snow along the tops of them, and in the foreground you have rocks and bushes.
- 4.5c It must be in the winter or sometime . . . in that the trees and the bushes don't seem have leaves on them, and the whole thing has a bare, drab, cold feeling.
- time No wonder it's cold! Oh, Ann, you've done it again! Oh, I get it now! At first the picture is confusing, because, mainly, it's upside down! That is a picture of a tree with lots of snow drooping off it, and the picture was very difficult to get until I suddenly recognized it as a picture we've had previously, only—well, it's been turned upside down. As soon as that happened, there was a complete perceptual reorganization. The whole thing became quite obvious. Before then it was quite confusing. I'm trying to get hold of a texture expression here, but I can't. I think it's an explanation—a defense of the bushes.

## PROTOCOL VIII

Subject Mo

Slide No. 16

- 0.0 A considerable area of light, but in the middle there seems to be the beginning of a figure—dark against a quite light background. It may be the trunk of a tree. So far it just looks like a pipe stem, kind of twisted together, standing up. Nothing definite, nothing structured, nothing that reminds me of anything especially, except another picture coming up.
- 1.0 Well, this time we saw again a patch of light, but running down through the middle we see what looks to me like the kind of insignia that they use in the navy, the anchor with a rope running down from the top and spiralling down to the bottom of the anchor. The anchor has two prongs. It looked to me as if it were the silhouette of that anchor. That's the first thing it reminds me of, and now I don't think it reminds me of anything else, except that.
- 2.0 Again, we see the anchor, and again it might be a dollar sign. There is a straight, upright piece with your spiralling of another shadow that looks like the S on a dollar sign. May still be the anchor, and, on the other hand, it may be that dollar sign. I don't see anything in the background except perfect blank whiteness. Just this thing in the foreground—this shadowy, anchor-like, dollar-sign-like thing. I don't know what it is.
- 3.0 Well, it doesn't seem to be as clean-cut now as it was before—clean-cut in respect to its being a dollar sign or an arrow—or an anchor, I should say. Now, it seemed to still be the anchor, but in the middle we have larger patches of blackness which kind of throws it off—throws the contours off considerably, so that it confuses. The shadows themselves—the black part seems to have gradations of greyness. I can't make out what it's all about, however.
- 3.5 Again I can't make it out. I see this central portion that takes up most of the picture. There seems to be, branching off from up-and-down axis, areas

of blackness irregularly placed, not placed like branches on a tree—Christmas tree, for example, or like the spokes of a wheel. Irregularly placed. I do not see what it is. It's got me, that's all. Just got me.

4.0 Nothing. I can't make it out. Happens to be the square, white light. Otherwise, it doesn't have anything else to it. This irregular kind of shape standing up in the middle of the thing, but that's all.

4.5a Oh, it is a man who is standing on an ox cart. He is holding the reins, and the oxen are coming toward us, and the camera seems to be almost between the oxen. The oxen are on either side of the ledge position. And this man is standing up on the oxen cart, and it's rumbling on toward us. And we have a view which puts—there's a line of—vanishing, or a line of perspective, looking down the oxen side toward the wagon, and we see the wagon and two front wheels and the man standing up. Kind of a buckboard arrangement.

4.5b That's fairly clear, now. This time it looks like a pair of jackasses. I thought I saw long ears. It's somebody driving a pair of domestic animals—I would say jackasses, or even mules. They have long ears, and he's driving towards us, and the man seems to be standing and holding the reins. I can't get any more details.

4.5c Now those animals—I—I—sometimes they look like oxen, sometimes they look like jackasses, now they look like a pair of cows; or it looks as if they might be those animals of the cow family which they use in India. He is still driving them, and there's some kind of a vehicle behind, and they are pulling the vehicle, with him on it. He is driving them, and the camera is in front, and they're coming toward us, out of the picture.

time Well, well, that's quite a surprise! It happens to be an X-ray of the pelvic bone, and you can see the spinal column. Very interesting! Those look like a pair of oxen, or I'll be damned! And that thing standing up in the background looked like a man in a striped shirt, driving a pair of oxen. I don't

know. It happens to be the human pelvic bone. I don't know what the blotches of ink are, on the spinal column. I imagine it's a poor negative, or something. I never suspected it was this. Well, all I can say is that this certainly surprises me. I thought they were shaping up to finally a man driving a pair of oxen. I—don't know (laughs). I don't know what you can get out of it—what I'm reporting, unless we say that—(laughs) never mind! Good grief!

#### PROTOCOL IX

Subject Ga

Slide No. 24

0.0 This is just a very faint all-over grey flash, with a slight, bright light showing at the bottom and the upper part of the flash, and the whole shape is sort of circular and very rough edges around the whole general shape of the flash.

1.0 The flash is still very definitely blurred, with some more light showing towards the left—or rather towards the bottom part of the flash, and sort of a general over-all grey objects or shadow showing throughout the flash, and it is not sharply outlined around the edges, it still being somewhat fuzzy, very definitely.

2.0 This—shadows now are more evenly dispersed throughout the flash, with bright patches of light shining through, and it—the outline is still irregular in shape, tending to be somewhat circular and the whole impression being of looking through a piece of stained glass, or possibly having some light shining through some stained glass that is not even on the surface.

3.0 The general impression of this flash now is that of X-ray of possibly a piece of tissue or—meaning human tissue or skin—or possibly that of an X-ray of lung structure. The shadows are more definitely outlined, but they're not forming any particular pattern, but they do give the general shape of being outlines of bones of some sort, and the general cast being—and shadowing is similar to what one would observe in an X-ray picture.

3.5 The general feeling of this one is still very blurred and dim in outline, but

reminds one of an interior of a greenhouse, with the light shining through the windows and the framework of the windows on the left forming the roof of the greenhouse. Within the middle there would be possibly structures holding flower boxes and—of various kinds, but it's still not sharply outlined enough to make such an object definitely visible. This is just a general impression of the flash. It's still indistinct in outline, but it shows the black shadows forming contours that would be similar to such an arrangement in a greenhouse.

4.0 The general aspect of the flash this time was of—that of a night scene that—more or less on the order of a street scene in London, for instance, at night, where there's a heavy fog and sort of an eerie light shining through a very over-cast sky. Looked like there might possibly be a lamp post on the left part of the picture and possibly another on the right, with the general outline at the bottom indicating possibly a street with a curb, but the—and some buildings sort of in the background on the right center part of the picture. Very ghostly aspect to the whole flash, but still not sharply enough outlined to make a definite conclusion.

4.5a Now this definitely looks more like a street scene, as if you were looking down upon sort of a slum area or a park of some sort, steps showing in the center left of the picture leading up to the street, and then along the street there's some sort of a railing and possibly indicating, beyond it, outline of sort of apartment houses or buildings of some sort. The lighting was very unusual, giving the effect of a stage setting that might be used for taking a moving picture. It didn't seem to be like there was sunlight, and yet it wasn't night, but more or less some sort of artificial light giving the general color or texture of the objects a rather black and grey combination. The ground showing in the foreground was that of a sort of ravine-like—or not necessarily a ravine, but sort of a ground of some sort, with not much grass on it, but looked like it could

be possibly a park of some sort, and that maybe a small stream would be over towards the right bottom of the picture.

4.5b This flash is somewhat more sharply outlined than before, and there seems to be a lamp post right in the center, with a bright light shining out from it, and it's casting out on the objects around it a rather eerie light, and they show out as sort of a black and grey texture. And it seems as if the perspective is that of looking down upon the scene, with steps in the center going out to some sort of a street, and this whole center part of the picture being some sort of a park or wooded area, with rolling, rather rough, uneven ground showing. It has sort of the appearance of what one could expect of sort of a slum area or semi-run-down section of the town.

4.5c This is somewhat more sharply outlined than before, and definitely shows the lamp post in the center, with the light shining, and then there are some branches of trees showing and some steps still on the left, and the ground showing is either just bare earth or possibly grass growing upon it, and it does seem to be some sort of a wooded park area that one might find in a residential section in a large city. The whole aspect of the picture is one of sort of a ghostly night-light quality to it, reminding one of scenes that may have appeared in moving picture shows where actually taken place.

time This flash seems to be taken from a height, looking down upon a park that comes out to a triangular-shaped point at a street intersection. The park has a street lamp right in the center part of the park, and the ground apparently is covered with snow, that is, uneven just as if it has been walked up and tracks are showing upon the snow. There are a series of trees spotted throughout without any leaves on them, indicating that it is probably winter weather. And the trees are fairly evenly spaced around the lamp—street lamp in the center part of the picture. And each one of the trees have lattice work going up part way the trunk to protect



the trunk of the tree. The park has four benches showing in the picture towards the—or rather along the edges of the park, and the wood benches with back rest in the middle, and then there's a bench on each side of the back rest. There just seem to be this large heavy planks of wood, sort of on the order of benches that one would find that are unfinished. The park comes to a point at the upper right part of the picture and has an opening coming into the picture—or rather . . . And just beyond this opening to the park is a street lamp that apparently is right on the corner where the sidewalk comes around the edge of the park. And on beyond this street lamp is a street intersection. There's nothing on the street—no vehicles. It's bare, but the sidewalks are showing. On the left street showing on the opposite side of the street from the park are buildings of some sort, indicating that they are either apartment house or possibly a warehouse of some sort. There are two or three windows showing that seem to have the shutters closed. And there's a rather large entrance indicated into the building. The park itself has an iron fence. Inside of the park from the fence there seems to be a row of shrubbery. On the left there is an evergreen tree of about four feet in height. And then there are two or three of those that are showing along—one of them farther down, towards the top part of the picture. And on the right, the shrubbery's not sharply outlined. It seems to be hidden in the shadows, but the indication or general impression that there's shrubbery along there that would be somewhat lower than the height of the fence. There seems to be a street light coming—throwing light into the picture from the left side of the picture and also from the right side of the picture, but the street lights themselves are not showing. It's just the reflection of the light from them. The trees in this park seem to be planted in definitely a pattern that forms a diamond-shaped pattern as you trace lines from one tree to another. In other words, there's a tree at the—towards the

pointed end of the park. And then there are two towards the center of the picture, to the side of this tree, and then there's one in the center of the picture, and these four trees will form a diamond. And then there are other trees to the left of the tree in the center of the park that form another diamond shape, and also to the right of this tree in the center of the picture are three trees, and they also form the shape of a diamond when the—when drawing imaginary lines between the trees. This indicates that the tree planting is definitely planned planting, because they, at the same time, in addition to forming these diamond patterns, also form straight lines when a line is drawn from one tree to another to another. These straight lines would go at an angle across the picture, sort of from top left down towards the bottom right part of the picture. The trees seem to be just—probably fairly newly planted, all of them being young trees, not very large as far as the size of the trunks are concerned. And the branches go up to approximately a height of fifteen or twenty feet, and there are no leaves on them, but they branch out—show the bare branches, sort of on the order of maple trees. The shadows from the light form a rather interesting pattern, inasmuch as we in this picture have light coming primarily from both sides of the picture and also from the center, and as a result of that the shadows cast by the trunks of the trees criss-cross in the picture, particularly towards the upper right part of the picture. And then the light reflected from the street lamp in the center part of the park form sort of a halo effect upon the snow, with four shadowed lines protr—coming out, forming sort of a division into four equal parts of a—of a imaginary circle. There's a tree showing at the bottom left part of the picture. One can just see the top of it, not the trunk, but it seems to be similar to the others and also placed in about the same order, in order to continue the diamond-shaped pattern of the trees. And also in terms of the straight lines in which the forms—the trees

form, it is regularly placed. The trees on the right and the left follow along a straight line sim—in continuity with the iron fence upon the edge of the park. . . . And the shadows cast by the branches reflects upon the ground and gives a rather sharp outline of the bench, being a reflection of the back rest and also two planks forming the seats of the bench. In the upper right part of the picture, the street seems coated with a thin coat of ice or something not the same texture as other parts of the street. One gets the idea it might be . . . The street seems to veer off at that portion.

#### PROTOCOL X

Subject Mo

Slide No. 24

- 0.0 Very indistinct grey patch of light, more grey than it is white. It's greyer around the edges than it is in the center.
- 1.0 Just your flash of light, but there seemed to be very bright spots around the edges so that it makes a star-shaped kind of figure like the artist's conception of what a diamond shines like, I suppose, or the sun. Definite white patches of light around, all centered around the central point, with dark around the edges, maybe between the white spots.
- 2.0 Again your indistinct flash of light, but the white, or the bright and the dark patches seem to be radiating from a central point—radiating up and down, across, and diagonally.
- 3.0 Nothing definite. Nothing definite. Nothing definite, except that it seems to be squarer, now, than it was before, with dark patches around the borders—dark patches that are not regular, but seem to merge in toward the center in irregular fashion—I mean, some points seem to be closer to the center than others, so that we have peaks and valleys along the border line. It's definitely rectangular, now.
- 3.5 Still rectangular, but there seems to be a string with a spider on it hanging down in the middle in the bright light—a string hanging down from a shadow, so that it may be a cave with some luminosity in the open part and this

spider hanging down on a string in this cave. I saw the string. It's a very—sort of a short string, or kind of stuff spiders weave, and the spider on the end of it, probably. That's about all.

- 4.0 Well, this picture seems to have depth. There is something in the foreground which seem like upright sticks, and they are so much in focus and the rest of the picture is so much out of focus that it gives me the impression of depth or third-dimensional properties. Depth—I don't know what we are looking into. It might be just into the air—into the sky; we might be looking out of an airplane, and—the stick sticking up might be antennae; or we may be looking into some deep, clear water, if it is a picture like that. And it's night. Nothing very definite in the background, but I get the impression of depth.
- 4.5a Your picture is upside down. I think the picture is upside down, because there is a string that—what seems like lamp posts which seem upside down. It looks as if the sky is at the bottom, where it should be at the top. You better check your picture.
- 4.5b Well, now it's a picture taken from above, so that we're looking down on a fairly well-lighted court yard, and we can see a row of trees. It might be in the moonlight, yet it might be one of those trick photographs which makes the sunlight look grey. A row of trees or lamp posts along the court yard, alley, or street. There seems to be no movement at all down below. It's a very quiet night, I would say. Doesn't seem to be anybody down there. Very peaceful-looking scene. Rather moody, too. I don't know. It still—I didn't see it long enough, but I still get the impression that something is upside down in that picture, or perhaps I am concentrating on the reflection of a landscape in the water.
- 4.5c There might be a regular landscape, but then there is also in the picture the reflection of the landscape in the water. It's rather confusing. I don't see the real landscape. I think I'm concentrating on the reflection rather than on the real landscape. The reflection also in-

cludes a lot of the sky which we cannot see if we looked at the regular scene. But there seem to be trees and some kind of a causeway, or road, or path. That's all—or it looks like Verde's Square.

time Ah, I don't know where I got the feeling of upside-downness, but I don't get it anymore. It isn't Verde's Square, because the streets are not big enough. It's a little square somewhere in England; maybe little benches and what not. Quiet; must be very late at night. Nobody around. About 3 A.M.—3 A.M. Very peaceful. I would say it was a warm night, too. Spring—probably rained a couple hours ago. Looks nice and fresh. That's all. I like the picture pretty much, except that it's badly composed; too much in the center.

#### PROTOCOL XI

Subject Ya

Slide No. 26

- 0.0 Is a flash of light radiating from a center, which is a round spot something like a sun hidden behind clouds. And the center of light is located toward the top and just to the right of the center of the slide.
- 1.0 There's nothing to add, except that the pattern of light in the upper left-hand corner is more generalized, and thus the dark pattern toward the center bottom of the picture can be seen in clearer relief.
- 2.0 This looks a little bit with—as if a sun was shining through a very cloudy sky. It takes the form of four major rays of light going out from the center at right-approximately right angles to each other, with the axis being—the axis being diagonal across the—the total slide. The rays seem to also be hooked a little bit like a swastika . . .
- 2.5 Nothing further to add to this exposure.
- 3.0 Still nothing to add, except there are three rays rather than four—three rays from that center of light. The center of light is the top center of the slide. One ray goes from it down toward the lower left-hand corner. One hits at right angles from it, downward, toward the lower right-hand corner, and the other

one is at about an even interval headed toward the right and looks as if, if it continued to the edge, would wind up about halfway between top and bottom on the right edge of the slide.

3.5 This exposure seems to change the pattern a bit. It seems to be—it looks as if it were a cloud—photograph of clouds with the sun shining through, with the clouds looking like storm clouds, dark and—very tenuous around the edges of the clouds.

4.0 Nothing to add from this exposure.

4.5a This, now, does not appear to be a picture of clouds at all, but a lighted-shadow effect taken of some sort of very barren landscape, as if it were from the Bad Lands in Dakota, with, toward the lower left-hand portion of the picture, a very steep, almost a hole in the ground, with hills rising up to surround it, and then a very complex pattern of hills with light and shadow going in all directions. Some of these are very bare hills and not covered with vegetation of any kind.

4.5b The same pattern seems to be present here.

4.5c This would seem to be the—a picture of some sort of Bad Land territory, a picture, perhaps, of an opening of a cave. There are some—some formations falling down over the edge into the hole in the ground that look—well, almost like stalagmites—or maybe they're stalagmites—at least, those long, pointed things hanging down—well, as if a waterfall had been frozen in action going over the right edge—the right-hand edge of this hole.

time (Very long pause) This would seem to be a close-up picture of a winter scene, taken at exceedingly close range. Perhaps it's a picture of a very tiny stream of water. Everything is snow-covered except the water, and the vegetation has grown right up very close to the edge of the stream and has formed some icicles between the—the small plants and the edge of the water. There are two branches of trees which have fallen down and are lying across the—this very tiny stream which I might say is—oh, perhaps a foot wide,—something of that



sort. One of those branches is fairly large—I would guess about four inches in diameter—and it is covered with snow, and the snow seems to be lying on lichens. It seems also that this branch has lichens on it under the—underneath the snow. The other branch which is right next to it is convex. The first one, which perhaps I didn't mention, is—now, wait a minute; I forget—arches upward—at any rate, over the stream. The other one arches downward, which, I suppose, makes the second one concave and the first one convex. The second one is a smaller branch, and it—they're both dead branches—dead trees. They're both covered with lichens, and they both have snow on them. It would appear that the water in this stream is rather dark. It has frozen very glassily, so that it reflects the vegetation above it rather clearly. It does, however, reflect it blackly, and one can see very little snow on the articles which are reflected. There seems to be a footprint of an animal in the snow just underneath the—the larger arching of the two branches on the far side of the stream. There is a pattern made by the vegetation covered with snow just behind that large branch, which gives an interesting similarity to a picture of—oh, a spider of some sort—centipede, perhaps. One can see something that looks almost like eyes and then a row of little legs, and a sort of furry texture to the whole thing.

#### PROTOCOL XII

##### Subject Re

Slide No. 43

- 0.0 Very dull flash. As a matter of fact, seems to be in two sections, upper and lower, with a dark obstruction right across the center part.
- 1.0 Same general dull view, with the central obstruction. Right now, it looks somewhat a picture seen a couple of days ago which I first called a Christmas tree. Was a scene taken from the inside of a small barn or out-house, with a jug on the other side of the doorway, in the sunlight.
- 2.0 Now seems to be something entirely different from that last view which I just described. Still just a dull flash with the light in the very center of it. There seemed to be a very dark object that had some form, but I can't make out exactly what that form is. The background seems to be broken up by foliage or something like that. Again, I can't make out what it is.
- 2.5 Still very dull, and whatever it is there—it there seems to be covered over with some reticula that gives a very filmy quality to the entire scene. Nothing definite can be seen beyond that.
- 3.0 Looks like a picture of something taken from behind a screen or netting of some sort. Either that, or it looks like a photomicrograph of capillary bed or photomicrograph of cell body of a nerve, with axones and dendrites radiating out from it. As a matter of fact, there's a distinctly biological quality to it, but there seems to be something behind it, as if it were a net, rather than the main point of view.
- 3.5 Same general quality. I think perhaps it's more of a net than anything else, now, because there's something that seems to be mostly broken up—obstructed by this dark, uneven reticula, and behind that there is something but I don't know what it is.
- 4.0 Now it looks like a picture of something taken from very high up, on the inside of a building, or a picture taken from below, looking all the way up the side of a building, and the open spaces of the reticula now are oddly-shaped windows, dark spaces being the wall . . . Scene was taken from below up or from above down. I suspect from below up.
- 4.5a Now seems to have been completely changed. Looks like a close-up of some type of fabric, or else feathers of a chicken, beyond which there are what look like eggs. Quite unsure of this.
- 4.5b Looks more and more like a fabric of some sort—some type of tweed. There's something in the background resting upon it which I can't make out, however.
- 4.5c Still can't make out what it is, except that now there seems to be rope stretching across this tweed fabric. The whole

picture is quite dull in that there aren't any very sharp contrasts. It's all low key.

time That's interesting. Low-keyed picture of a net upon which are resting miscellaneous objects: a black feather, pipe with bowl formed in the shape of a man, some sea shells. The light is coming from the . . . right and is almost parallel but not quite to the . . . that is almost on a level with the . . .

### PROTOCOL XIII

Subject Li Slide No. 46

- 0.0 Oh, my goodness. This is a piece about a foot wide, running in the vertical completely off the screen on both sides, both ends on the bottom, and it has grey streaks running vertically through it.
- 1.0 Same type thing, only it's more diversified—more scattered.
- 2.0 It's as though you had turned a picture of a rough tree on its side.
- 2.5 Of course, it could be a wind-blown landscape on its side, too, in that there are things running down which might be like trees bending over in the wind.
- 3.0 Get the feeling as though the left part of it might be something like an X-ray picture. The right part of it be—would be the undeveloped film, or it could be the type thing you get when you're looking at a . . . prepared on a slide.
- 3.5 It looked like a X-ray of a fish.
- 4.0 This is the first time that a definite feeling of roughness or of blotched . . . has come out all through the picture. You get a feeling that there are little ridges and—parts that stand up. I can't quite—the word I want. But I still can't attach any name to it. I—I don't know what it is.
- 4.5a It gives you the impression that it's a ship. You're looking over the side of the ship, and there's a man coming up the side. The only trouble with that is the part that should be the water isn't water, because it doesn't have the right feel. It feels more like sand than water. Consequently, I don't know what it is, but there's apparently—is a man coming up the side of it.

4.5b I get the same thing, no matter how . . .

time Wow, brother! What I thought was a man is a bottle, and the ground is right—a sailing vessel. . . . And what I considered as the boat is apparently the side of a wooden house. . . . Well, I got the feeling that you had some pine cones spread through the picture.

### PROTOCOL XIV

Subject Mo Slide No. 49

- 0.0 Oh, very, very dull. Very, very low key color, tint. Not very intense flash of light. It seemed to be more bright at the top rather than at the lower part of the picture. Very indistinct.
- 1.0 Still very, very indistinct, although the shadow seems localized around the middle part of it—the middle horizontal part of the picture, with most of the light being at the top. Very indistinct, nothing. That's all.
- 2.0 Very, very indistinct, although there seems to—the shadows seem to be localized in the middle, with light spots at the top and at the bottom, but there seem to be shapes or loo—well, they seem to be looming up like clouds of smoke or something in the middle of the picture. Nothing distinct, though. No cues. Just this indefinite, vague pattern.
- 2.5 Very indefinite, vague pattern. There seems to be a concentration of shadow on the left—on the right, I mean. That's about all. Nothing very definite. Nothing suggesting anything particular.
- 3.0 I don't know. It looks as if it's probably just a blob of—well, on a wet paper you put some water color down in the middle, and it runs all over the place in irregular kind of lines, and so on. It doesn't look like much of anything.
- 3.5 I can't see anything that suggests anything yet, except that this is just a pattern of light and shadow—light merging into shadow and shadow merging into light. That's all. No definite boundaries or anything to suggest anything in particular.
- 4.0 Looks as if it might be an inside view of some manufacturing plant, with the

light coming down from the skylight openings. The picture seems to have depth, now, as if we're looking on the floor of a large machine shop where you see a lot of machines and people working. The light and shadow seems to suggest depth and—it's a complicated picture, anyway, when it does come out. That's about all—with the light localized at the top.

4-5a Looked to me like a bunch of automobiles all jammed up in a traffic jam. They shine enough so that I think it's raining. Must be some kind of occasion in a big city, and all the automobiles are trying to get down the—down the—down the avenue. The cars look rather old-fashioned, too. There's some Model-T's mixed in with them. It may be a parking lot of some kind, but, anyway, it—I think there's a terrific congestion of cars, all bumper to bumper, side by side. That's all.

4-5b There's automobiles there, all right, because you can see the high-lights glistening and the darkness of it all—I mean, there's a bunch of automobiles there. Now, it may be an automobile factory where there are—people are working on them. I think I saw a couple figures in there. Anyway, it's—it's a mass of automobiles of quite old vintage—oh, probably 15, 20 years ago.

4-5c Now there seem to be several people working on the automobiles, or walking around, or something. It may be a picture of an auto show—people looking at them. Yeah, I think it's a bunch of automobiles, just the same. Nothing else came out.

time Well, well, well! Not automobiles, anyway. Well, Mirror Lake, of course. Well, I feel like a fool, unless I can explain where I saw the automobile (laughs). Well, you see those lily pads. Well, you look down on the lily pads and look as if the—you can look down into the water, and there's depth. It looks three-dimensional, so that below those blue lily pads toward the middle you can see what looks like head-lights and wheels—stuff. Definitely dark. And that li—bright portion at the top looked like a skylight, or something or other. Anyway, those highlights all the way

through the water, so I thought it was raining, but it's still plenty wet. Over—it looks like an automobile. See the tire, side of the car over here where it's dark. I thought it was a bunch of automobiles. That's rather amazing, the way those lily pads took on a blue color—the reflection of the sky. Yeah . . . picture, although I wish they hadn't had—hadn't included that ugly mountain. That's all.

#### PROTOCOL XV

Subject Pi

Slide No. 49

0.0 There's a dark spot in the center that looks somewhat like an outline of a bird. There's the body, and then there's the wing outstretched somewhere.

1.0 It reaches the edges of the picture, now, and there's some vertical dark and light stripes in the center.

2.0 Now there are some horizontal and also vertical stripes in the picture, perhaps a sort of blotched tweed effect. I'm not sure just quite how they seem, but that's the best way I can express it.

2.5 . . . more mottled now, like the background of an old-fashioned photographer's screen.

3.0 The darker portions are at the bottom of the picture, and they're sort of mingled light and dark. There's a light portion across the top of the picture. Perhaps it's a scenery picture of some sort, with the horizon close to the top and a light spot for the sky all the way across.

3.5 There seem to be some lines across the light spot, so I think that shoots the landscape idea. I don't know what the rest of it is. It's still very indefinite.

4.0 There seems to be a car beside a lake—a river. Perhaps the river is at a dam, because there's something across the river in the background. Seem to be other cars and people around, I think.

4-5a It is a car or something beside a body of water, and there's a limestone fence in the background, or a bank in the background.

4-5b I believe there's a person leaning over the car and other people around. Perhaps it's a camping spot.

4-5c Oops! I think the car is just the way the lights and darks went. It seems to be



—perhaps it's Mirror Lake. It's just some water, with maybe a few people around by it, but the part I thought was the car seems to be some imperfections in the grass and the water.

time It's a colored picture of Mirror Lake. I didn't see the color at all. The lily pond—lily pads in the dark part here that I saw along with the light streak across—a little higher in that—in the picture are what I thought was the car, and the person that I thought I saw leaning over it was at the left, a dark spot bending over. But it's a picture of the lake. I saw the water above this colored dark and light part and also the background the—well, the limestone part in the background. There is the Wishing Well and the sulphur springs up at the top of the picture, and that's the light part of the picture I saw earlier. I didn't recognize the front part as the part of the water until just the last picture I saw.

#### GENERAL ANALYSIS

No more important statement may be made relative to an over-all of the data than a corroboration of the previous discussion on the constructive nature of perception. The phenomenon is evident in every protocol of the 958 records collected. Subjects admitted it either in fact or by implication within the developmental sequence itself. Subject Ku, for example, rehearsed the creative act in a portion of one report:

11-3.5<sup>37</sup> First, when it flashed on, it looked like some sort of creepy-looking face, something that you'd see in a horror show. It looked very frightening. And then, as I looked at it further, a little bit longer, it didn't look like that at all. It still had the shape of a shield—<sup>38</sup> but it didn't resemble a face, only at the first glance it did.—

<sup>37</sup> Quotations from protocols are always accompanied by a numerical specification of (1) the slide number, and (2) the focal point from which material is lifted. Thus, the present citation would actually read: (Slide No.) 11—(focal point) 3.5.

<sup>38</sup> Three dashes (—) used in excerpts from pro-

Now, a flash at 2.5 ms. could hardly be conceded to have provided for the subject any more than an instantaneous view of the stimulus. Any adjustments in perception which are reported to have occurred later could have stemmed from a variety of sources, but the fact that adjustment took place is the substantial and abiding point. Subject Pi, in commenting on the difference between Slides Nos. 17-22 exposed only at IF and the usual OF-IF procedure, noted that she was aware of adding in the OF-IF sequence things which were not verified by the sensory data. A quotation by Subject Jo denoted the same recognition of construction:

13-4.5<sup>39</sup> Oh, that time I saw it clearly for the first time, although not long. Looks as though there might be a statue standing in front of the building. It's hard to describe the details, even though I saw them. I didn't see them long enough; and whatever I said, I just keep filling in from what I think the building is like.

The pattern of this constructive process appears to have been duplicated with imposing fidelity in every slide progression, even in view of differences in emphasis at various stages of the construction. The gradations of the sequence are not always equivalent in time nor in intensity, but they adhere to a uniform course approximating three phases of transformation:

#### (1) *A beginning sensory stage:* Here

protocols indicate intentional omissions in quotation. Three dots ( . . . ) are used when verbatim material was not unmistakably decipherable in the original record and hence was omitted in transcription.

<sup>39</sup> This analysis into phases is not intended to imply that the phases are completely independent of each other. Indeed, one of the difficulties in selection of protocols for quotation was the fact that most excerpts demonstrate not one but several simultaneous influences. In spite of this blending, however, distinctions in function and point of appearance are readily apparent among the various levels.

is a purely descriptive level in which the sensory data are acknowledged and defined by whatever means are available to the subject. The restricted nature of the data, at least so far as perception is concerned, is indicated by the limited variety of classifications into which the descriptions are fitted, even though the OF-IF method provides no other material competing for discussion at the moment. This stage is always present to greatest extent in the first few focal points reported, and often persists in modified degree much further, sometimes even into the time exposure itself. All of the following excerpts are responses at the sensory level.

#### SUBJECT FU

8-0.0 This looks like a—the flash that I saw seemed more to the left of the screen and just a—a white that blends into a darker shadow, and these shadows weren't up or down, or from right or left. They were just sort of—oh, something splashed around in this white background.

#### SUBJECT MO

7-0.0 This is a very regularly distributed patch of light. No high spots and no low spots in it. Just a general patch of grey light—a square of it.

#### SUBJECT PI

14-1.0 The edges seem to be having some lines in them, perhaps vertical. I don't know which direction, exactly, the lines run on the side, and the center portion seems lighter.

(2) *An intermediate exploratory stage:* This is distinctly a transitional level, and in the present study, because of the elongated OF-IF technique employed, seems proportionately more extensive and active than the other levels. The appearance of time which it emphasizes is no doubt exaggerated, but in point of its influence on the subsequent succession of perceptual events, it is probably an accurate estimate. Subject Ci was par-

ticularly verbal in expressing the experience of this level:

32-2.5 Now the picture has assumed more diffuseness, or more detail seems to be coming out. It's the usual sequence of stages. First, there seems to be much less in the picture. As the focus increases, there's more material; and there always is a point for me when I feel that—very much in it and I can't—well, accommodate it.

34-2.0 There's a pointed, dark-shaped planting towards the right. But it almost seems that I see less when I have no notion of what this may be. And as soon as I get some definite ideas, I start to check to fit in and exclude on the basis of my concept. But I am now totally at sea.

This level is probably seldom, if ever, perpetuated long in isolation of the preceding and succeeding ones. Since its role appears to be entirely functional, vestiges of the sensory level may remain even after transforming processes have arisen; and, again, despite overtures prophetic of the final and culminating perceptual step, there may be ample evidences in well-advanced phases that the trial-and-error cautions have not yet been totally discarded.

(3) *A final interpretative stage:* This is largely an acceptance level, implying that the tentative possibilities of the preceding stage have somehow been discriminated among and that a choice has been reached which now can be named with satisfaction. That the choice carries factors in it which far exceed the original sensory stage in which it took root is further evidence of the constructive treatment to which it has been subjected in development. It is only at this level that subjects could refer to the "brightly colored kerchief" in Slide No. 39, a "clump of coral" in Slide No. 34, an "autumn day" in Slide No. 8, a "New England farm scene" in Slide No. 27 (A), and an "old world city" in Slide No. 19.

## SPECIFIC ANALYSIS

*Sensory Stage*

What trends do the reports exhibit at this early level? The difficulty is not to find illustrations, but to limit the sampling among a well-nigh mass of repetitive instances. The following excerpts are typical of all the protocols reported.

## SUBJECT LI

35-0.0 Thin grey streaks on the right. On the left side, darker grey streaks in the center, with a hollow part in them.

-1.0 Grey streaks are a little deep—denser, and more joined together, especially in the central region.

-2.0 The upper part of the picture has more solidity than in the other part. It's as though there were two grey streaks coming down, forming an inverted view.

## SUBJECT FU

30-0.0 This time it seemed to be dark up the center, rather hazy looking, and whiter at the bottom. And then it went in, and then out, and then in again. And on either side there seemed to be—oh, a light part, not out to the edge of the picture but curved and sort of indefinite. The feeling I have whenever I look at these flashes the first time is that they are the same one. I usually have the feeling that they are about the same on either side. I don't know whether that's just because it's so hazy and everything that your eyes sort of make up what they don't see and therefore make both sides seem symmetrical, but I usually have the feeling that they are.

43-0.0 This is sort of a hard thing to explain. There's a dark place in the center, and this is sort of fan-shaped, leaning towards the right—the upper right-hand corner. And then around this is the light part of the picture. It's sort of a curved affair and seemed more curved—the part that's toward the top—than the one to where it curves down to the bottom, because when it goes down towards the bottom it's almost parallel to the right-hand side. And this light part is broken in—not broken into, but in. In this light part there are dark openings.

It would thus appear that the actual sensory stimulus lends itself to expres-

sion in terms of such elements as density (haziness, diffusion), intensity (darkness, brightness, lightness, greyness), location or position, size, direction of tendency, and counting. There are, to be sure, references even at this level to patterns and shapes, and there is a very early search for suitable geometric forms by which the shaping can be specified. It is probable, however, that shapes this early are clearly distinct from the forms which make tentative appearances at the exploratory level and which reach such developmental prominence at the point of interpretation. In view, too, of the intimate function concerned with meaning which asymmetrical forms come to play in the later stages, it is doubtful if the geometric patterns and forms assigned at the sensory level are anything more than verbal implements for manipulating the only material yet available. Excerpts from the protocols would tend to affirm this assumption.

## SUBJECT JO

5-3.0 I think I could draw this better than I could describe it.—I don't think I can verbalize this, because what I saw didn't fit into any standardized shape.

43-1.0 Was a definite pattern of light, and the dark was . . . , but it doesn't follow any simple geometric figure, so I can't label it.

## SUBJECT MO

38-3.0 Very unstructured. Very hazy and misty. Nothing stands out particularly. I can't make anything out of it except the general form. And again, it's that thing which is inverted—inverted triangle, but now part at the bottom getting wider as it goes up the screen. Nothing can be made of it yet.

40-0.0 A halo of light in the mid-top middle of the portion—top middle portion of the—of the screen. The halo is elliptical. Very pronouncedly elliptical, with the apex and the lower—both apexes—well, the thing is—is in a horizontal position. The lateral sides are—so that the lateral sides are facing each of the two edges of the picture. It's an



up-and-down ellipse. That's what I mean to say. That stands out more clearly than anything else. The rest of it seems very black.

45 (B)—2.5 Oh, God, I don't know. There just seems to be some indefinite, vague suggestion of shadows in the right—the left, sort of an elliptical, ball-shaped thing up high, and then some suggestion of pattern. These shadows make a pattern of some kind which is up and down. And that's about all. Very indefinite. There seems to be a greyness extending from the left to the right, an irregular staccato greyness which—uhm, I don't know what it is. Seems to be some kind of border, a—some kind of a design. That's all.

#### SUBJECT YA

34—0.0 This is a very faint exposure of light in a rhomboid shape with a dark center.

—2.0 Nothing to add. Wait a minute—except that the upper right-hand angle is an acute angle, the lower right-hand angle is rou—obtuse and rounded, the upper left-hand angle is straight—is a right angle, the lower left-hand angle is acute.

—2.5 There's an additional pattern out to the right in which there is another outline which makes almost a parallelogram.

#### SUBJECT ZO

11—3.0 Now the object is taking up a shape of a—well, it's almost a circle, but it seems to come to a point at the bottom, and the top seems to be flattened out somewhat. It's directly in the center of the screen and is surrounded by darker places, and the—it must be curved or something, some shape that causes light to be reflected from it, because there are lighter places and hollow—darker spots which probably are hollow.

Some of this fairly elementary technique is occasionally persistent even into clear and well delineated foci.

#### SUBJECT JO

14—time—It's easy to see in long exposure, but the snow is just in long, drippy shapes, and there isn't any nice geometric form you can apply to it.—

What service the sensory material fulfills may rightly be questioned, particularly in recognition of the impressive changes which it eventually undergoes.

Obviously its primary utility resides in its stimulating and initiating activity. Other roles may be gauged from the instances in which it persists into succeeding levels, sometimes as a cautious reluctance against outright commitment to a wholly new level; often as the only manageable data yet available for perceptual manipulation; and occasionally, still further, as a contribution to be integrated into the total hierarchy. Illustrations of the first will abound in the discussion which follows on the transitional level. The second is beautifully revealed in the later focal points of Slide No. 5, when both the clock and center bottle have been identified and interpreted in terms of type, purpose, material, and such, but the right-hand object, still evading recognition, can only be cited as a collection of sensory elements bound in a circular geometric form. The third, the integrative utility, will be cited at the interpretative level when such sensory cues as position and counting guide the derivation of meaningful identity. Here, however, it may be worth a reminder that an element such as position, as it occurs in the sensory stage, is perceived as a point of location within the framework of the projection screen, whereas position as a cue in the final interpretation is framed within a context that has already not only exceeded the stimulating circumstances in its figure-ground relationships but has acquired a meaning in its own right. One may suspect these to be two entirely different settings for the emergence of psychological phenomena.

#### *Transitional Stage*

The evolution of perceptual experience out of sensory materials is manifestly a turbulent activity. The faintest and most primitive announcements of

the onset of these throes are not at all well-directed, but they are nonetheless expressive of the state of restlessness which erupts when the sensory stage is no longer sufficient to support the developmental progress. In the present instance this point was most often phrased in terms of feeling states, and the early phases of the protocols are weighted with characteristic comments.<sup>40</sup>

#### SUBJECT LI

15-3.0 I can't get the feel of this one; it's hard on my—snow with window panes and other—I just can't express myself on this one. It's sort of a "no feeling," or—and the right-hand side is apparently the banked-up side such as you would have on trees. On the left it doesn't feel right for that type of picture.

16-4.5c—I'm taking after-images on these and reconstructing them. I have a feeling this is that picture of the girl and the skull. Something keeps forcing me to want to say that's what it is.

29(B)-4.0 It's as though there were someone standing on the left side, and someone—ah, I don't know—a group back of you. I would say it's a feeling—I don't know. They're running down, or kind of expanding or something on this right side, but I can't find—can't put it into some—some object. It's merely a sort of kinesthetic localization! (Laughs)

43-3.5 This is horrible! It's agonizing! I have a feeling of this thing, and yet I just

<sup>40</sup> Bartlett (2, 262) reported many similar instances, which he analyzed in the following way: "But, as in these experiments, there are plenty of cases in which a subject, without definitely giving a name, will say that he has an impression that what is presented is an instance of something. This impression seems capable of analysis into (a) an apprehension of what is given, and (b) a feeling not quite definite enough to be called a feeling of familiarity, but rather merely of the relative ease with which the act of apprehending is carried out. The latter is a true feeling, attaching to the whole act, and not a vague apprehension—called a feeling only because of its vagueness—of relations of parts within an object. This feeling may have a good deal to do with the influence of general experience upon perceiving, and at any rate is at the foundation of much imaging."

can't get a-hold of it! Something like—oh, a statue, or a foreground in a park. And then there are lots of trees, but—it seems like the thing is turned upside down.

#### SUBJECT CI

3-1.0 It didn't seem quite the same as at first, but still I can't tell what gave me the impression of it's being different.

#### SUBJECT HI

46-3.0 I couldn't see anything further this time, I don't believe, but I have a slight indication that there might be one object about half-way up in this lattice work which is also white. Something tells me it's something like a kitten, but I don't have anything to verify that.

#### SUBJECT KU

v14-3.0 It had a feeling—gave you the feeling as if they were round or circular shaped—.

#### SUBJECT RE

25-2.0 Still a bright flash. I have a feeling there's something there, but I can't make it out at all.

51-3.0 There's a very peculiar quality about what I've been seeing. I haven't been seeing any form at all. Either it's much faster or there's color in it. Why I say color, I don't know, except I have a feeling of other than purish grey. . . .

#### SUBJECT JO

29(A)-3.0 I had the peculiar sensation of feeling I was seeing a close-up of two people, but I did not see anything clearly.

52-2.5 I had a very funny sensation, then, as though there were two children sitting on the floor.—

#### SUBJECT DA

v14-4.0 This time the center of attention is still in the center and the left, and I got the feeling that I sensed something that I didn't know what it was. That is, it was clear enough for me to get a definite impression even though I couldn't "catch hold" of it. However, it seemed to be—something which ends in this white tracing was in the center, a little right, and leaning up against sort of a back-drop. Whether it's a person or something else, I don't know.

## SUBJECT FU

29 (A)—3.0 This time I had the feeling that it was the picture of maybe a little girl on the right hand side that would have dark hair that was straight, and she had bangs. And, we're standing perhaps by a window sill looking up at something in a—oh, maybe a bird in a cage, or something like that. That was just a very indefinite kind of impression I got. I don't know whether—whether I saw enough things that way or enough that would suggest to me that that might be it.

39—4.5b— For some reason, I think of blue. I don't know why. There isn't anything in the picture that suggests it. I just feel as though the blouse would be blue.

Sometimes the feeling states were put as tensions from lack of organization.

## SUBJECT CI

29 (A)—2.0 More detail to which, however, I cannot as yet fit into a whole.

## SUBJECT PI

25—4.5c The cross-hatching is still there, and the other things I mentioned are there, but I can't organize them into any more.

## SUBJECT DA

34—4.5a Again a very clear impression, but still no organization.—

## SUBJECT WO

50—4.5c—And—I can't put much in context yet. I don't—can't see just what it is.

Whether these states of tension are the motivating agents themselves, or their release merely clears the stage, they are soon supplanted by aggressive acts that display all the ear-marks of trial-and-error behavior. It is almost as though the subject has been caught in the act of going through his repertoire of perceptual experiences to find the best fit for the present pattern. Some of the methods introduced for accomplishing a fit seem among the most significant revelations of the present data.

There is, first of all, a mild attempt to expand the potency of the sensory data

by adding other factors, but the struggle never gets beyond the compromise stage because its supplementary contributions are still forced into the matrix of the sensory materials themselves. The only analogies, therefore, which are available from experience are unformed, unbounded, and diffused sensory qualities such as clouds, smoke, sunsets, moonlight, and the like. Their placement in the protocols is always immediately after a pure sensory description or as a regressive protection when more developed attempts have proven too bold for the content at new focal points. Subject Mo, who was one of the more adventurous observers in his early exploratory efforts, made repeated use of this particular technique:

2—0.0 There seemed to be streamers. Perhaps they were cumulus clouds. The same streamer-like—streamers going from top toward the bottom of the screen. Going up and down. Cumulus clouds . . . That's about all I saw.

6—1.0 The lower part of the black band there would seem to be a reflection of the upper part. It looked as if it was a picture of a midnight sun with dark clouds, with a reflection of water, probably.

—3.5 This looked like a sky effect. The black bands are more distinct, and it looks like clouds, probably a sunset. Probably is a sunset. Cloud-like effect. And there doesn't seem to be anything of any definite form at all. Just kind of nebulous, hazy, foggy.

—4.5a That was much more distinct. I saw some water—dark water. It seems like a grey sea; not rough sea, but kind of calm and with an ebb—ebbing tide, shall we say?—with a sky above. Generally a very grey, cold-looking ocean scene.

10—1.0 This to me looks like the shadows cast by trees in the moonlight. The shadow we're looking at happens to be on the sidewalk, or on a black surface of pavement, or even on the surface of the snow. The shadows are indistinct. The moonlight on a foggy night, or probably bright sunlight, and this seems blurry, fuzzy. Shadows on a black surface.



14-4.5c I can't make anything out of it. It doesn't look like a snow crystal any more. It looks like something that wasn't designed. It seems to be a natural figure. I don't know what it is: whether it's water or lightning or a cracked windshield. The directions of the lines seem very random and not planned. I don't know what it is.

#### SUBJECT DA:

6-3.5 This time I have—I have the fleeting impression almost of a moonlight scene on water. The dark band is still there. However, the light mouth that I mentioned before has differentiated, and there are several very elliptical light spots over in the right center—right half of this belt, but my general impression was this over-all moonlight scene, without any specific point.

24-4.0 Again this peculiar four-leafing of the light which is in the lower center. In some ways it looks like this sort of scene: you're looking into a sunset, and in the upper part of the picture is an airplane flying, but that—that's just an impression:—

#### SUBJECT ZO

9-4.0 Now the light spot, I'm very sure, is cloud, and they seem to be billowing out in the center of the screen. And above that it seems to be darker, as though storm clouds, or something of that sort. There still is a shape on the white spot, but I can't tell exactly what it is. And it seems that the foreground in the lower left-hand corner seems to be sort of rolling terrain, or perhaps an expanse of water. I can't tell just exactly what it is, yet.

#### SUBJECT PI

43-0.0 There seemed to be some lines in the upper left-hand corner and across the center of the picture, sort of splotches like if you—like it appear if you took the paint on a very wet water-color brush and splotched it about three or four places.

#### SUBJECT RE

36(B)-3.0 Looks like pretty much the same view as described before, except that now the man seems to be becoming transparent. He had a good bit of solidity in the last one, but now he seems to be transparent—sort of Dali-ish in quality. No other details of the

room can be seen, although there's a feeling that there's a person there.

#### SUBJECT GA

42-3.5 Down at the bottom there's a—the top was just about the same, but down at the bottom there seemed to be something that was very white and crystalline-looking. It reminded me of steel, or something of that type. It didn't look particularly heavy, but it had a shine and the appearance of steel. It was very light and silvery-looking—. And there were little round circular things. It was just as though it was a— a sewer pipe or something, with something tied around it all the way down.—

#### SUBJECT FU

24-3.0 This time I had the feeling that there's a light intermixed in the dark. It gave the feeling of the sky on a real—when it's real dark and it's just beginning to—oh, the sun is shining above it, and you have the feeling that there are some real dark places, then the light breaks through. The light and the dark both look real fluffy, like the clouds would—I mean, the outlines are very soft and blend into the other one.

References to perspective or distance perception, which had earlier been suspected to represent entirely separate factors, upon analysis betrayed surprising similarities to these tentative sensory expansions. Again, the protocols divulge them in their genetic setting. As employed by some of the observers, perspective seems to be a method for achieving an acceptable combination of both diffused sensory data and better formed transitional proposals; and if this deduction is correct, then the perspective factor is definitely a low-grade and elemental conciliatory agent.

#### SUBJECT HI

15-2.0 This time I saw black lines or streaks running through the right side of the picture, although the other was pretty well blurred and grey. It was like looking out through a large window when it's misty and foggy outside.

## SUBJECT P1

25-4.5a I don't know just exactly what it is. There seems to be a great deal of depth behind the cross-hatching in the picture, and the cross-hatching of the picture seems to have taken on a little more depth also. Perhaps it's a number of boxes—empty boxes stacked up. They're open from side to side. I'm not sure.

There are some implications that perspective may be introduced as a consequence of increasing distinction, the clearer objects assuming the foreground position.

## SUBJECT P1

13-4.5c The street lamps seem to be coming closer to me each time. The picture—the church gets further back, and the lamps further forward each time.

## SUBJECT RE

v14-4.0 Pretty clear view, but I don't know what the view is. There isn't sufficient contrast for me to quite make out what's going on, except that there seems to be considerable distance involved and some objects in the foreground . . . are somewhat out of focus, as if there was a picture of a landscape . . . with trees or overhanging bushes. It looks like an outdoor scene, but that's about all I can say.

-4.5c Very clear. Still somewhat confusing. The scene looks as if it was taken with a very dark filter. The sky looks quite dim. Either that, or it's going to snow again. I had some difficulty in locating some place from which to look out upon the entire . . . May be a result of the general diffusion.

26-3.0 Has changed completely, and it is beginning to take on some form quality and three-dimensionality. However, I can't quite make out what it is. I'd say that it looked as if there were a flashlight in the bottom sector with the light shining rather brightly upon some object located in the lower right quadrant. Other than that, nothing.

-4.5b Same general view, only a little clearer. I'm not at all sure that it is a cavity in a tree trunk, but it could just as well be that as anything else at the present stage.

34-3.5 Seems to have changed now. Looks like a landscape. Some hills in the distance and something in the right-hand side obscuring part of the view, as if it were a tree with a rather narrow trunk. Seems to be considerable depth, but what it is that's extending into the third dimension, I don't know.

35-3.5 Now it's beginning to look more like a landscape of some sort, but why it does, I don't know, except that the background seems to be rather rocky, cliffish. And it seems to be considerable distance to the foreground and the background. Forms are very poorly defined, and there isn't much brightness, so that it's still rather difficult to tell what it is, and I'm—

## SUBJECT ZO

14-4.5c There still isn't a great deal of change. It looks almost now as though there were three dimensions. And the various things—objects seem to be sort of in relief, but it's still too indistinct to tell.

26-4.5c Now the picture is beginning to have three dimensions, but, aside from the fact the things are a little more sharply defined, there is still no difference.

## SUBJECT KU

9-4.5c There was an odd sensation as if the picture were starting out in the room or out in space somewhere, and you saw right into it.—

24-3.5 Gave me the impression of being under something, or rather crowded feeling. The whole top half of the . . . seems to be very dark, with the white at the bottom. Stretching from one side to the other, with the bits of black kind of dripping down into the white—the white space. There were few shades of light and dark up above in the top part that was very dark, but so few that it gave you the feeling of something covering you, or great big clouds, as if you were looking down at the picture, and all you could see was little bit of the land and great big clouds, as if your focal point or something was right in the middle of the big dark mass.

39-2.0 There was—there were a number of dark shapes and figures in the back. In the very center is what seemed like it's back. Gave me the feeling of moving back in, but it's really in the center.—

## SUBJECT WO

39-2.5 Well, the shadows are sort of mixed all around, now, but I can't see anything in particular. They almost form sort of a big gateway, but just because of the vagueness of it.

## SUBJECT MO

7-4.0 This view seems to be looking at the grass from a higher level so that you cover more surface area of the grass and not so much the view of the whole field of grass at once. Looked like a field, I guess. The points of the grass seem to be very sharp.

-4.5c Still seems like the same thing, only there seems to be a vanishing point in the picture converging in the distance so that you get the feeling that you're looking down a long road—wavy lines down an asphalt road. They're tracks on an asphalt road. That's about all I can see. That's the same thing I've been seeing all along—just wavy lines. I can't make head or tail out of it. Doesn't seem to be anything at all.

11-3.0 This time I saw something very definite—pattern against a black background. In general we might say it was shaped like a kite—a kite. It has four sides. The two top sides—when they come to a point at the top, the angle isn't as sharp as the two bottom sides that come to a very sharp angle. It was that kind of a quadrilateral. It wasn't round—it wasn't sharp at the edges, but rather rounded. And around the edges of the border there was—as though there was a kind of streakiness, so that it looked as if you were looking into somebody's eyes. A fish, maybe. Maybe there's some teeth or something to eat with around the edges. I don't know. It looked to me as if you were looking into something. There wasn't any . . . out of the picture. It looked as if you were looking down or off into cavity of some kind.

Subject Ya illustrated neatly how the distance factor, providing refuge predominantly in sensory qualities, eliminates the necessity for accepted form and hence leaves the observer free to make tentative gestures toward interpretation without releasing the sensory support. When the bolder attempts at textural identification become unsafe, perspec-

tive is again a handy retreat:

14-4.5a This seems to be a picture of a rocky structure in a wilderness, as if the picture were taken in a gorge and showing, perhaps, from the inside of a cave in which one sees a rock wall to the left and some foliage out through some kind of an aperture in stone. It seems very clear, however, that there is stone in this picture. Might be a gorge, a ravine, or, as I previously said, perhaps a cave.

-4.5b This could be a picture in a cave, or perhaps even a picture in a tunnel. Centers of light seem to be light coming into a dark area cut out of stone either by nature or by man, probably by man. The general impression now is one of sufficient evenness of the rock walls, and it should be a tunnel, with light coming in through apertures at the right.

Mention of perspective is not confined, however, to the OF steps. There are numerous applications of it even at the time level, and some of the illustrations here at least hint that its role at clear focus may be intimately related to figural-groundal contrasts. How much of the utility at clear focus may be an outgrowth of discrepancies between expectancy and revelation of the time exposure the protocols may clarify. If that is the primary function at this level, then the role is still predominantly a protective and elementary one.

## SUBJECT LI

12—time It isn't quite what I had visualized it to be, in that there is apparently only one span, and I had the feeling that the picture only gave one half of the thing, and that the second span started over on the right corner where there were dark shadows. And also, I had made the bridge not near as high as it is, and the boat was heading toward, or very close to, the other side of the span, which means that the boat was . . . up. The top of the bridge outlines were not seen nearly so clear, in that the tracks down the middle were not differentiated as being such. But the height of this thing makes me—I can feel a tremendous height here that



I couldn't feel in the rapid exposure. It's quite evident that—that this—this height is—made so real and apparent by the back of this boat which appeared to be small previously, and it hadn't been taken into consideration that it was so small. Now . . . not only in the boat, but it has two men in it, and the smallness of it makes the height terrific . . . to it. I just can't get over it, Ann!

#### SUBJECT FU

42—time —Then, as I said before, the water looks . . . dark, except in spots where the light hits it, which gives you the feeling of great depth, and—because it's so dark underneath. And then also the feeling that there might be breakers when you look at it quickly. But it really just seems to be the light.—

As dimensionality is occasionally referred to, one wonders to what extent it may assist in bringing about a figure-ground relationship.

#### SUBJECT TA

28—3.5 The picture seems to be divided into a lower right foreground and an upper left background. The central field is simply light and dark areas. The dividing line seems to go rather sharply from the lower left to the middle of the right side of the screen.

#### SUBJECT DA

34—2.5 Not a great deal added, except that in describing the right-hand side a little more clearly, maybe /it'd be better to say that there is this light diagonal, but there's also a dark diagonal right along side of it. And then, this white in the center with some—again some dark around the edge. It begins to look as if there is something there, that is, the pieces are fitting together, and I'm even getting a little impression of depth, but I still—it's still very meaningless.

Consequent to the sensory analogies come the first observable attempts to effect a break from the sensory restrictions. Even at this point, still so far removed from the eventual achievement of form, that feat is promoted by feelers

in the guise of textural or surface qualities. Their marked characteristics are the caution with which they are tendered, sometimes almost apologetically; their betrayal of the difficulty of expressing analogies independent of the sensory data without the benefit of a supporting framework of form; and their frequent withdrawal and replacement by substitute suggestions. And very interesting, indeed, in connection with the latter point, is the fact that, on the final time exposure when there is no longer available the "protection" from the speedy removal of data during the flashes, the amount of hesitation and vacillation with textural responses will often show a pronounced increase.

#### SUBJECT YA

7—3.5 This would seem to be a picture of a field—a field, perhaps of wheat, of some flowers, taken across rather a wide expanse, with perhaps a low range of hills in the background.

—4.5a And now, I'm not quite so certain that this is actually a grain field. It may merely be plowed ground.—The general impression of its being either a field of grain or clouds comes from the fact that curving and irregular lines characterize the field.

—4.5b —Now it—it also looks as if these curved lines or unusual marks on the field are not either necessarily vegetation or contours of plowing, but might conceivably be, oh, something that looks almost as if potatoes had been dug and left lying on the ground. So this is a third possibility, that there is vegetation, that it is plowed ground, or that some sort of object—perhaps stones, perhaps potatoes—are strewn over the entire surface of this land.

—4.5c —Again, this time I have the definite impression that it is a field which is littered with some object, which might now be not necessarily such things as stones and potatoes but could possibly be corn stalks or something of that sort, after the field had been harvested.

—time This is a picture which is a little difficult for me to interpret. I'm not quite

familiar with the outlines of this land. —In the—in my own experience I would . . . remember terrain such as this as being found at a salt water beach when the tide is out, though the ripples don't look quite regular enough to be the kind of ripples left in the sand with the tide going off. —It would be—if it were a beach with the tide gone out, it would be a rather muddy bottom or black sand, rather than the familiar grey, hard-packing sand.—

Subject Ku attempts this textural expansiveness even at the initial flash:

29(A)—0.0 There was a very smudgy-looking black spot way down at the bottom in the center. It seemed to have the texture of some kind of fruit that you might cut open. It resembled the inside of a coconut as you cut it in slices, or an orange, or some kind of fruit like that. It was rather large, but very, very hazy. It looked as if it had a big coating of dust all over it, but yet it had some sort of a design that gave it this . . . of having some sort of texture. The general background was a little hazy, too. It wasn't as blank white as it usually is. It seemed rather grey looking. And the bottom of the center was just a wee bit darker.

#### SUBJECT MO

7—3.0 Well, this was again your grey background, but in the foreground, about covering the lower five-eighths of the picture, was what seemed to be grassy reeds or something waving in the breeze, like a wheat field, say, or grass—jungle grass, maybe, but that's about all. It's a suggestion, not very definite—a suggestion of blades of grass in the foreground, very close together, standing about waist high to a man. That's all.

—4.5b Oh, this had streaks of—wavy streaks of light, and the background was black. Now, I can't imagine what this would be, except I did see streaks of light. They look like little worms. They weren't very long, and it wasn't one continuous long piece of wavy line, but the lines were definitely—the lines were short little lines—wavy lines. I can't imagine what it is, unless it's a picture of water rippling. Maybe water rippling—dark water rippling. That's about all. I don't know. It's a puzzle. I can't figure it out. I don't know what to do with it.

14—4.5b Well, now it looks like a cracked windshield—this unbreakable, non-shatterproof—shatterproof glass, shall we say?—with the glass where it is cracked reflecting more light than the other parts of the glass, and therefore not being transparent. However, it may be a picture of boiling water in a stream—white water, rapid. That's about all.

42—4.5a This is a—either a seascape or a landscape turned upside down. The spider-web pattern is a pattern of light and shadow on either freshly tilled land or a slightly choppy sea.

43—4.5a Oh, now we see a kind of a webbed-like effect at the bottom. It might be some kind of fabric—textile, or even a fish net. I don't know what it is. It might be also the scales on a snake's hide. There seem to be a regular interlacing of threads, or patterns of interlacing, or something. But I don't know. Looks like a fabric, or a skin, or a hide from a snake. But as—along the top of the picture, I don't know. This interlacing caught my eye. It seems to be some kind of a upright thing and a cross-piece. Very indefinite. I don't know what it is.

#### SUBJECT LI

28—4.0 There would seem to be grass or foliage along the greater part of the left side, and a building in the right center, although it doesn't seem put there. It's—there's just no reason to say it. About the only definite thing you can get is the feeling of grass or herbage along the left side.

#### SUBJECT JO

14—4.5b I still can't see what it is—can't tell what it is, even though I can see it. I suppose guessing the inside of a cave is as good as anything, but there are a lot of surface irregularities.

v14—4.5b It looked like frost on a window pane.

26—time —It looks like this sort of thing might be a close-up of a tapestry, so that you get confused between the medium of expression and what it's trying to express.

#### SUBJECT NA

33—time It looks like some parts of a beach, because the right side could be water because it's solid, and there are white streaks up the edge that could be foam, but the material there doesn't look like sand. It looks

like some hard substance. And there are—and there are circles on the ground which look as though they were made by putting a Coca-Cola cap over the thing and pressing it down so that the material came up and was left in the shape of a circle. Then there are little pieces of that material. It still looks like part of the moon's surface to me. Otherwise, it could be part of a beach. Parts of it seem to be porous, full of little holes.

#### SUBJECT DA

33-4.0 This time, what it looked like was—incidentally, this is a very clear impression. It looked like just a portion of the moon's surface where you have a lot of sort of volcanic projections, though, unlike the moon, rather than their being craters, they were round, almost like a lot of igloos on this surface, and just seeing a flash of the moon on the left-hand side so that the —around this silhouetting that is just darkness. But that was a very clear impression of these many, many little blisters, really, on a surface of a planet, or whatever it—

-4.5a Even a clearer impression this time. However, what I may be seeing instead of a surface of a moon is—in the background—this irregular background, and then in front these sort of just blisters, regular spheres, and then over on the right deepening again into shadow, but—in other words, here I'm getting a differentiation of the foreground with background. It doesn't seem like the side, looking at it—this object at a tangent, but looking at it straight on, with these little spheres in front of the background.

-4.5b Again, the same—this one is sort of a combination of the last two. I'm not sure whether it is looking at this moon, or whatever it is, at a tangent or looking at—but these blisters seem to dissociate themselves from the background. And yet it would be a much easier explanation to say that they were blisters on this surface that I was looking at at a tangent, but somehow they don't "plaster" themselves against that surface. So I'm a little undecided at this point.

-time Well, I can see why I was undecided last time, because I'm undecided this time! I don't know what this is. It might be an aerial view of looking down on some surface other than a lunar body, but why do we have this fading off into this background

over on the right-hand side? It might be water with little islands and outjettings. However, that wouldn't be in line with what we hear of the surfaces of these bodies. It might be space; and yet how can we account for these little dots of light, sort of islands? Because if it were space, then I think that they would either fall in toward the body itself, if there was any gravity at all, so that doesn't explain itself. Maybe it's just a photograph of some metal which has been rusted and corroded. Perhaps that's it. But it looks on too large a scale. I prefer the astronomical interpretation. I think one reason why these blisters seem to me to be dissociated from the surface is that there are shadows, and I think the shadow of the side of the projection made me bring them out from the surface. I think that's the reason for that.

#### SUBJECT FU

11-4.0 It still looks like a face. However, now, instead of looking so much like a mask it looks as though it might be stone of some sort of background. Would be rather rough, and not a solid color. Sort of like a—I don't know whether to call it stone, but if stone could be like tweed material, that's what the stone looks like.

26-time —And this looks like it might be stone, or the effect that real light pastry would give—that if you grabbed it, it would crumple, or else that it would be very hard, and—feel like the material that they—that the little shell figures that you get in Florida are quite often set in.—

43-4.5a This—the material on the bottom this time didn't look so much like fur, or something that would be a hard surface, but still material, like it—it looked sort of been woven. That, or something like that, but still curved and not flat.

#### SUBJECT WO

26-4.0 Oh! It's—it's taking some form. Oh, it—it's sort of a mottled appearance, almost like a—the colors that you sh—of an animal's fur that would show up—the light and shadow. I can't make a definite form out of it yet, though.

#### SUBJECT PI

49-2.0 Now there are some horizontal and also vertical stripes in the picture, perhaps



a sort of a blotched tweed effect. I'm not sure just quite how they seem, but that's the best way I can express it.

#### SUBJECT LI

7-time —I can't emphasize the situation sufficiently enough to satisfy that it's either sand or water. It's a case in which the boundaries are not well-defined enough, and yet there isn't enough textile qualities given, other than that of the reflection, to make a decision on it.

Eventually arrives a point at which the observer will admit that form itself is present and no longer only its substitutes. Progressive development is still the nature of the sequence, however, for form seems first felt rather than known, and certainly its delineation has still a long course to run before it is closed. The amount of conversation devoted to judgments about the clarity of outlines and areas of sensory concentration is noteworthy, and it is probable that specific developments at this point are best reserved for analysis as figure-ground phenomena. Reports from observers, however, on the first experiences of form admission are significant in considering the original generality and uniformity out of which so many later interpretative distinctions are extracted. Subject Jo was repeatedly vocal at this point:

16-2.0 I see it more clearly, but it's hard to describe what I see, because the figure is changing from just light and dark differentiations to a pattern with distinct details. I don't know if I can say clearly what I mean, but at first it's just a shape, and then it has to turn into a figure which you recognize; and when it changes from one to the other it's hard to say what it is.

18-3.0 The grey and white pattern is beginning to take up the—to take form of a picture, so that I've lost the previous form and am not able to group what I did see in anything describable.

30-1.0 The dark pattern in the center is no longer solid, but it's difficult to say what

sort of a pattern it's breaking up into.

44-3.0 The difficulty with the foreground pattern is, it's breaking up and I can't see it.

48-3.0 See, this time there's a—very clearly a new form emerging but that—I couldn't see it well enough to tell what it was.

Subject Re was equally vocal:

23(A)-3.5 —There seems to be more on the screen, but I just can't hook it together.

38-2.0 I can see some form, but I don't know what I'm seeing. Not very contrasty.—

—2.5 I see form. Can't quite make it out.

49-3.0 Now there are very distinct figures there, except that they're so diffuse. By distinct, that is, I *know* that there's something there now. Before I was simply guessing. But I don't know what they are, nor can I have very much of an idea as to how they're distributed.—

#### SUBJECT WO

6-4.5a Looks as though there may be something in the foreground that I can't distinguish, something jutting out.—

#### SUBJECT PI

18-3.5 The cross-hatching seems to be approaching the center just slightly more, and the lower left-hand side seems to be becoming a little more definite. I cannot yet tell what it is, but it is becoming—the form is becoming more definite.

43-2.5 The outlines of the hole are becoming a little more definite, but there's nothing more I can say about the picture itself.

—3.0 There's something a little different happening down in the lower left-hand corner. I'm not just sure what it's going to turn out to be, though.

#### SUBJECT BO

25-4.5a This time I was a little bit confused. I don't believe I know what I saw.

#### SUBJECT ZO

40-1.0 Now there is very little change in this. There seems to be two objects—darker objects in about the center of this white spot. They're just small circle. But there were—I don't know for sure whether they were there or whether I just imagined them.

43-0.0 Now the flash seems to be rather—well, it—it's sort of a grey, but there are several darker, rather thick lines showing in it, almost like figures. But it—it—they—they're thick in places and thin in other places.

#### SUBJECT DA

v14-4.5b —It looks very much like some sort of still-life scene of a flower—something, but I can't anchor that impression.

#### SUBJECT LI

36(B)-3.0 Get a definite feeling of a large figure and shape in this, but I can't express it in any definite object.

#### SUBJECT CI

26-2.5 This time I saw something, but it—took shape, but it's hard to name it in any way, because all I saw was that the whiteness has a bottom border which seems to be slightly depressed, that is, like an arc, with the whiteness dipping lower in the center and on the sides.

#### SUBJECT HI

39-2.0 It's taking on some sort of a form, but since it's blurry I can't exactly distinguish what it is.—

42-2.0 There's something taking shape on the le—on the left side. I can't quite identify it.

43-3.0 I still can't identify it. The—something like a pattern, but it's not consistent enough to be one.—

In consideration of the preparations which precede it, form designation in perception can hardly be appraised as less than an advanced-level order of performance. But form specification *per se* no more guarantees perceptual completion than the ventures which precede it, and it, too, runs a course in development until the "fit" that is achieved warrants the embellishments of the interpretative level. The first overtures with form beyond the mere expression of pertinent feeling tones are often decidedly sparse in content, and they may be tendered on the basis of the slightest of evidence.

Needless to say, they are more often grossly inaccurate than correct.

#### SUBJECT MO

2-2.0 Again there were indistinct bands of light, vertical. I can't figure out what it is in the center. Looks . . . to me like something like striated muscles. I don't know!

7-2.0 Still a square, grey patch of light. There's nothing much else. Reminds me of nothing but probably a drawn shade.

12-3.0 Well, this was still the same light, but it seems to me that it looks as if it's a picture of some roof tops—roof tops. I don't know where I get the impression, but it seems to me I saw chimneys and some slanting roof tops, as though the sun is hitting the roofs at different angles. Some seem brighter than others.

#### SUBJECT YA

30-3.5 Looks almost as if it might be a picture of some very complicated piece of statuary but generally vertical but gracefully curving lines. I couldn't, however, say what it is a statue of.

#### SUBJECT HI

39-2.5 The object in the center looks something like two eggs being fried. However, the yolk isn't that large, and it's a smaller, round, dark spot, and rounded in the dark area.

47-4.5b It looked like a part of a gas range, with the circles being part of the grill over the gas jet and the central part being the gas jet itself. That's what it looks like, but I don't think it is.

#### SUBJECT KU

39-2.5 It seems to give you a feeling of—of round shapes. There . . . round lines, like the line you'd find in the way a roll is put together—way you find sweet rolls all wound together, as if you were looking down at the top of them.—

#### SUBJECT RE

31-3.0 Dull flash. Looks like the engine of a power truck, the crankshaft extending in both directions from a bend. I'm pretty sure that that's not what it is. The light is very evenly distributed over the entire surface except for this central massive section.

## SUBJECT TA

38-4.5a No, it's—looks like—it looks like a picture of a—well, it may be a typewriter, at that, with a lamp in the foreground.

## SUBJECT LI

14-3.0 Can't quite grasp the feel of that, but it's more or less like a series of buildings running, oh, down the side of a street, and it's definitely changed.

In a very few cases do these meagre attempts satisfy, and in many instances the very phraseology indicates that the subjects intended them simply as verbal comparisons instead of absolute criteria. At least they have the advantage of placing the subject in the position of a commitment that approaches the interpretative level more closely than any of the sensory configurations which have preceded them. And very frequently they seem to instigate a whole volley of tentative form matchings which may subsequently be run through.

## SUBJECT MO

38-3.5 It's still more confusing than it was before.—There seems to be something in the foreground so that it's closer to us on this side of the clearing. It may be a man, it may be an animal, it may be a structure, it may be a telephone, it may be a pole of some kind, or sticks, or some kind of a stand. I don't know. Still indistinct, and I—shadowy, misty. I don't know what it is.

## SUBJECT ZO

42-4.5b Now the—it still looks as it did. In the foreground there seems to be something—well, it might be a road, or it might be a wall, or a fence, or something of that sort. It's too—I still didn't get to see what it was, exactly.

## SUBJECT PI

3-3.5 It seemed to be either pipes, or smokestacks, or some other type of fiber, like some cloth, or a diagram of a nerve fiber . . . pointing toward a point a little right of center.

These multiple trials are sometimes scattered over several focal points as one after another flash clarifies a mounting form. Subject Li, for instance, on Slide No. 51, tried successively the normal distribution curve, a huge bell hump, a bee hive, a hat, and a stone before arriving at the monument marker. Subject Re offered texture on Slide No. 18 (IF series), but attributed it variously to a cat, a fox, a wolf, a silver fox coat, an opossum, a squirrel, an animal, a feline, carpeting, a hooked rug, and monk's cloth. Subject Mo, on Slides Nos. 23(A) and (B), ran the gauntlet of mildew on a sheet, three colonies of microbes on lung tissue, a pair of balloons in mid-air, a microscopic photograph of male and female plants, a wallpaper design, and a picture of a card with printed figures, before the real objects began to be named. One report from Subject Ci, on Slide No. 43, would indicate that some of the welter of form possibilities tried out may not even be verbalized and hence not opened to measurement. None of the tentative patterns listed in this particular excerpt had been mentioned at all before, although the report indicates that they had been intrinsically present for the subject:

43—time I had considerable difficulty making out the pipe in the center. I could recognize the stem very clearly for what it was, although for a time I was doubtful whether it might not be a writing croft, for instance. But the head itself looked something like a glove to me at first, and it was considerable time before I could recognize the shape.—

It seems decidedly important not to confuse these forms named in the transitional stage with those which are accepted at the interpretative level. For a cautious observer like Subject Zo, the sensory stage persisted over an inordi-



nately long period, and forms when acknowledged, came quickly, then almost as rapidly moved into interpretation. Some of this appearance of rapidity of shift with Subject Zo may even be misleading, if our method conceals transitions that took place but passed unreported. An observer like Subject Mo, on the other hand, who began to experiment with tentative techniques almost immediately, might offer a veritable directory of form names that are to be construed no more seriously than any other phase of the total trial-an-error sequence. Indeed, over and over again it was the subject himself who admitted the insufficiency of the forms suggested and hastened to qualify, revoke, or replace them; and there were fully as many ways of doing this as there were subjects in the study. Subject Re confessed once to a characteristic effort at self-protection; and on another occasion the same subject remarked that his frequent comment, "It was clear but I couldn't describe it," might have easily been replaced by a report of the qualities *felt* had there been some experimental pressure to force fuller reporting. Excerpts from Subject Re show other defensive devices:

24-3.0 Looks like a picture of a tree taken through foliage. The foliage seems to have two little birds upon it, but where I get that, I don't know.

36(B)-2.5 -I'm quite sure this isn't what it is, but this is what it looks like.

48-2.0 Flash seems somewhat brighter. In the lower left quartile there's a form of some kind. I can't quite-I'm quite sure I don't know what it is, but it looks like an arm chair, high-backed, someone seated in it rather erectly, so that there's a distance between the back of the chair and the back of the individual. But I know that's not what I'm looking at.

Subject Ci, somewhat late in the experimental series, commented on the

fact that he was usually one exposure late in mentioning an impression because he had learned previously that his early impressions were often in error and he now preferred to confirm them before mentioning them. He, too, had characteristic phrases in reporting which symbolized his caution:

5-time -I think I saw the leaves coming out of the fruit basket before, but I wasn't sure enough. Now, in retrospect, it seems to me as if I saw them before.-

29(B)-3.5 I believe it is a painting. I was tempted to say that before, but it seemed merely a wild guess.

32-0.0 No impression worth mentioning.

38-4.0 -then something like tree trunks going up in the center of the picture, but I'm not at all sure. The tree is really a simile more than the actual observation.-

Other observers, not always so lucid in introspective revelations, still gave clues in their routine reports of these same habits of confirmation.

#### SUBJECT LI

16-3.5 I get even more the feeling of a face. I know it can't be a face, because there's a white-a black streak up through the center of the . . . And yet I can't grab a-hold of what it possibly is.

51-time -I had the feeling that this was "Leather." And yet it didn't sound logical, so I wouldn't say it! (Laughs)

#### SUBJECT GA

31-2.5 The objects are very definitely blurred, even yet. -The object in the foreground still has sort of the general shape of a violin, although just in shape only, not in the form itself.

51-3.0 The center portion of this flash has the general out-co-outline or contour of a bell-rather, bell-shaped. Of course, it is not actually a bell, but that's just the contour of it that is formed by the shadows.-

#### SUBJECT JO

5-2.0 This is very hard to describe. The picture took on more shape, and I notice the -much more definite outline in the center

of the slide and stretching almost from the top almost to the bottom. The shapes that I saw reminded me of the drawing of a uterus. Not that I think the two are the same, but that's what it reminded me of.

-4.5a The flowers are in a basket. I thought it was a basket last time but wasn't sure enough to say so.—

#### SUBJECT HI

18-3.0 It appears to look like vines which are very much tangled together. I don't say that that is what it is; it gives that appearance.—

Subjects Wo and Ya both admitted at the end of the total series that they had often reported that everything in their momentary experiences had been described but that there were things omitted which they had classified as "not worth mentioning."<sup>41</sup>

Some of the secondary portions of the reports at this level testify eloquently to the struggle which undergirds the termination of the perceptual act. There is, for example, a veritable study in itself in the fluctuations of vocabulary in which the trials at this level are clothed. It might be suspected that the words themselves are the patterns being tried out, and in some cases it may be true that the symbolic cues are the objects of manipulation. An inspection of the protocols, however, leaves just as likely the possibility that the language inadequacies appear pretentious because verbalization has no other instrumentation, whereas, in reality, they actually reflect more basic ordeals. Subject Wo's protocols were often heavily weighted with trial-and-error of this sort:

29(A)-3.5 Oh, I could see—looks almost

<sup>41</sup> Smith (97, 326) observed similar tendencies toward self-protection among his subjects: "It will be seen that by this method of answering he left room for retreat in case of mistake, and gave first an interpretation broad enough to avoid nearly every likelihood of error."

like a—oh, a—something—somebody looking at something over here.—

35-4.5a Yeah, it's—it's an ou—it's—there's a stream in there, I think.—

40-4.5b Oh, is this one of those pictures of—the—with the pictures in the eye and a picture of a—of a—oh, it's a very symbolic representation? I think I've seen it before. What—what does it . . . ? Something, anyway. There's a picture of a girl in this—oh, it's his left eye, the one I see on the right, here. And there's probably one in the other eye, too. I don't remember what it's supposed to represent, now, but I've seen something of the sort before.

Subject Da made the interesting comment that she always experienced a definite impression of the exposures but that in reporting she often felt at a loss to express the nature of the impression. When, for example, she had decided upon a phrase, she would then, as she put it, have "to step out of herself" to inspect the choice of phrase in objective reality, to see if its usual meaning conveyed her impression. If the fit proved unsatisfactory, she must jump back into a subjective state and find a modification for it. Thus, with "zigzag" as a descriptive term, she visualized upon objective inspection a set of lines much sharper and more pointed than she had intended, and she had to rescind it in favor of "wavy." It was this same subject, again, who commented at one point that she sometimes knew exposures for which she had no vocabulary description available, and the report, "It is like an X," might not actually mean that she perceived it as an X at all. From this subject we also get:

37(A)—time The whole thing is—the whole thing is—I'd better decide what I'm going to say—is pretty much as I thought it was.—

Subject Fu, in expressing her pleasure at the clarity of Slides Nos. 17-22 in IF, localized the difficulty of the OF steps

as primarily a problem in finding fine enough distinctions in words to match distinctions between exposures. Thus, she admitted that "a blur of light with light streaks" might be repeated a number of times when the impressions of the blurs were not at all alike, only because she had no better verbal discriminations at her command. This subject on Slide No. 10, even at time exposure, struggled with language handicaps, finding no clearer selections than "you have the idea that," "makes you feel as though," "as though it were," "that's what you think," "this cylinder, for lack of a better word." Again:

30-1.0 This time the shadow—well, I think you can sort of explain this best by saying: take your index finger and your thumb, and start at the bottom, and have them quite far apart. And then start up the picture so that your index finger's on the left-hand part of the picture and your thumb on the right. And as you go up, let your right thumb stay about the same. And your index finger would start out, and then it would go in—in and out, and then it becomes smaller at the top. Both your thumb and your index finger would be closer together by the time you got at the top.

#### SUBJECT MO

6-4.5c —there seems to be a railing of some kind, a railing which has holes—I mean, well, the bannisters—I don't know how to describe it, but it's a solid piece of concrete railing, and you had holes. Around the holes, along the edges here and there, at regular intervals like that . . . with a kind of a . . . or something. I don't know.

44-2.0 Oh, I don't know how to describe this. There seems to be a—a kind of a green tone to the shadow and a pink tone to the background. There seems to—I don't know how to describe it. It's a—well, up and down, kind of as if the thing was put on wet paper and water colors or oil, or somebody had brushed the dark color up and down and in a way which—well, seem to be running into the pink portion, fairly sharp and definite. That's all.

Subject Jo once remarked that often she saw but had no word to express her impression and that subsequent shots might add little more but finally she was just able to say or name. From naming, then, she proceeded to fill in from experience.

Because these language difficulties had been anticipated, the suggestion had been included in the initial instructions that drawing might be used as another form of reporting. Sketching was often resorted to, frequently after some such conclusion as Subject Fu arrived at for Slide No. 37(A), at time exposure: "May I draw the house? I feel the lack of words!" Subject Da noted that she felt almost "naked" until she had the sketching pencil in her hand, and nearly every one of her sessions produced extensive doodlings, if not related drawings. Subjects Fu, Da, Wo, Ga, Ci, Pi, Jo, and Ya were all observed many times to be using the one free hand in random movements while reporting into the Ediphone; and several of these made additional foot movements that were plainly audible to the experimenter.

Observers in some instances could find no better way to vent the futility of their struggles than to rationalize a lapse of memory. Subject Zo, after reporting on focal point 2.0 for Slide No. 32, hesitated, declaring that something still bothered her but that she could bring forth nothing further at the moment. Subject Da gave a similar performance at the end of 4.0 on Slide No. 29(B), saying that there was something still not reported but that she could not remember it. At the same focal point on Slide No. 36(A), the same subject debated before proceeding, saying that she knew she had seen more than she could now recall. Some of the protocol illustrations here are especially interesting, particu-



larly for Slide No. 5, where the heterogeneous detailing must have been acutely provoking of these memory lapses.

#### SUBJECT FU

5-3.0 Just from what I saw it looked like—as if it were a bottle, or something shaped like a bottle, with the top of it dark and something white around the bottom. And then on either side it was dark, but I can't remember what it looked like.

#### SUBJECT JO

5-3.5 Now I saw a—looked like a bottle of wine with a straw base, two figures on either side. I saw them quite clearly at the moment of the exposure, but between that and mentioning it I have forgotten what I saw. One may be a clock, but I can't remember at all.—

#### SUBJECT DA

5-2.0 This time a dark spot, somewhat gourd-shaped, that is, with the long narrow neck expanding out at the bottom into a broad sort of knob in the center, and then certain other darker spots. I seem to see it very clearly, but now when I get into it I don't remember exactly the design, but there were some dark spots. The whole thing—it would seem much clearer, and seemed to have much more of a distinctive quality of form.

28-2.5 This time no longer dots but more shaded areas, almost like snow balls, though not that round. There's the roundest one near the center on the right-hand side. On the left-hand side there is one which has a sort of square space; and then on the left-hand side of that base there's a long sort of finger going up. Also some other shapes throughout the thing which I don't remember well enough to describe.

34-1.0 —There was also some sort of darkness over in the lower right-hand corner, but I don't remember that clearly at all.

Subject Ci, whose introspective reports throughout were peculiarly valuable, said for Slide No. 38:

38-4.5a —It seems that as I'm talking the impression fades and that I saw more than I can describe right now.

Subject Hi gave a priceless account of

the fleeting quality of these soon-lost images:

10-4.5a I still can't distinguish exactly what it is. I seem to grasp it for a split second and then lose it, possibly because I haven't been looking at the center of the screen. I look a little to the bottom of the center of the screen.

16-4.0 For a millionth of a second I saw something there! I saw that in two parts, as if you flashed it on the screen twice.—

Subject Zo had the exceptional experience of being able to name in the end the part of the impression which had temporarily escaped her. After completing her report on Slide No. 33, she added to her previous report on Slide No. 29 (B): "Now I know what the difference was [between the girls in (A) and (B)]. It was in the back of my mind all through this [Slide No. 33] picture, and I wanted to put my finger on it. I think it was the sophistication."

Not to achieve perceptual completion at times evoked strong marks of frustration in the transitory stage. A favorite release was an aggressive denunciation of the length of exposure time, highly interesting whenever it occurred because of its conspicuous absence otherwise. Subject Wo, for instance, exploded:

30-4.0 Well, gosh, that was too fast. It may be a dog, it may be something else, but I'll never know. But it looked like an outline.

#### SUBJECT RE

51-2.0 Same general view. The exposures, however, seem a little faster now. I may have forgotten what they were like, however.

—2.5 Still fairly dim. I'd be willing to bet the exposure's a little faster now.

#### SUBJECT HI

45(A)-3.0 I believe I could have caught them this time if it wasn't for the shortness—or rather dullness.—

#### SUBJECT JO

1-4.0 This seemed to be a pattern of

black on white. I saw it clearly for the first time, but not long enough to make anything out of the details.—

#### SUBJECT MO

17-4.5d —I can't see enough of it; you flick it too quick.—I can see it all, but you don't give me chance enough to look at it and try to reconstruct it or put it together.—

#### SUBJECT FU

17-4.5a —I felt as though I'd seen the picture, the whole thing, but not quite long enough to tell exactly what it was.—

37(A)-4.5a —This time I had the feeling that it was a very distinct picture, but I couldn't—I mean, that it was in focus and very clear, but—that I didn't see it quite long enough to see the whole picture as if I had—clearly—as well—remember it as well as I would have if I'd seen it longer.—

49-4.5a —I didn't see it long enough to tell what it was, but I had the feeling of depth and—

Apparently from the focal points indicated in the excerpts, the exposure speed as a scapegoat for ineffective transition became most valuable when clear focus was reached and the condition of the sensory data was no longer vulnerable to attack.

As already suggested in an excerpt from Subject Hi, fixation point on the projection screen was sometimes objectified sufficiently to carry the burden of blame for ineffective performance. Once figure and ground separations occurred, the figure was reported by a few observers to compel continuing fixation, even when details in the other quadrants were thereby being neglected. On the other hand, Subjects Fu, Da, Re, and Mo specifically acknowledged that they tended to organize the exposures into segments and then rotate fixation points in a systematic fashion.

Subject Mo had a characteristic way of evaluating many slides at the time exposure point, and there was a conspicu-

ous tendency to reject the slides which had been most difficult to deal with (i.e., Nos. 7, 10, 26, 34, 35, 38, 45(A), 48) in favor of those which had been more successfully named (i.e., Nos. 8, 18, 31).

Subject Ci very early in the sessions developed a resistance toward the earliest OF steps and expressed in more than one aside the antagonistic attitude with which he received these:

33-2.0 It seems rather hopeless to plan at this stage to make a sensible whole of the impression.

34-0.0 I almost feel that I pay less attention now to the first out-of-focus short-time exposures, because I have that feeling of impossibility of recognition. I have that feeling because I seem to be unable to locate the light and shadow properly after the first view.

Time exposures for Slides Nos. 36(A) and (B), 42, 45(B), and 48 were subjected to criticism by Subjects Fu, Jo, and Re for lacking the focus and clarity of other slides. Inverted, reversed, and ambiguous slides confused some subjects who were unwilling to risk an attempt toward interpretation, or were still dissatisfied even after making tentative efforts. Occasions when the time exposures failed to substantiate the set build up in earlier flashes, and the experience of making no further progress on repeated IF steps, were also frustrating. Subject Mo probably summarized the unspoken reaction of several other subjects when he commented that he sat down in an earnest, trusting attitude, and photomontage and inverted pictures antagonized him because he felt that he had been cheated.

#### *Interpretative Stage*

The zenith of perceptual inventiveness is consummated at the level of interpretation. The prior struggles in coping with the sensory requirements may have

been prolonged and difficult, but there is no other reflection, once this point is concluded, but that the stimulating data have at last yielded to the perceiver's own designs. There is an air of assurance and confidence here which is sensed at no other stage; and the subject seems, in some way, to have acquired a feeling of freedom which licenses him to all manner of liberties with the sensory properties toward which he originally maintained so much discretion. Certainly if the nature of perceptual activity could be briefed into a single representative citation, it would be an example from this level of the phenomenal transformations of the stimulus with which the perceiver seems finally content to rest the case.

Some of the protocols in the present data are magnificently illustrative of this climactic termination. The records for Subject Ya contain numerous particularly fine specimens:

13—time This is a building which I think is unquestionably a church in the background of a public square. It has foliage, that is, it is behind a fence as indicated. There are four posts for—ornate posts in this fence, between the middle two of which there is an open gate—two gates, one standing completely open, one partially ajar. On the top of all four of these posts are lights, well, rather European in their—in their shape. The building is—I'm judging the building to be a church building or religious building of some description. It has three spires, two shorter ones on the outside, and a larger one on the—in the middle. Each of these has an extension at the top which doesn't quite look like a cross but may be a cross faced in another direction. There are two crosses placed on the edge of the building—really, on the roof of the building, and two Maltese crosses—I think they're Maltese crosses, that is, a double-crossed cross, appears as decoration on the two outer spires. At the top of the middle spire we can barely see the base of something extending above the spire itself, which I would imagine would turn out

to be a cross. The clock, which was previously mentioned, is right in the middle of the center portion of the building, and it states the time as being 10 minutes past 11.

The public square which is in front of this church—or building, at least, is organized around an equestrian statue standing in the middle of it. There is foliage throughout the park, and this foliage indicates that this is a sub-tropical area. There are some palm trees. However, the foliage doesn't look completely tropical. There's a small sign to the left of the—and in front of the fence which has to be read backwards, so apparently it is read from the other side of the fence. (Leaning forward in chair) Trying to read it, I think—I believe that I can read "Jackson Square." Now, as I say, this is backwards. Now, this—at this point I wish I knew a little more history. Perhaps I could locate—that may be a statue of Andrew Jackson, though I would be a little surprised, perhaps, if it were. No, perhaps it is. At any rate, it is a Catholic—a Catholic church and a public square, part of which is called "Jackson Square", organized—in front of the equestrian statue is a flagpole with an American flag. This is apparently taken in one of the southern states, with some Spanish influence in its architecture and Catholic church. Now, directly to the right of this church or church building which is in the center of the picture is another building which can be seen with a series of dormers running around it and with a very small bell-shaped tower rising out of the middle. This might well, I should think, be in New Orleans, Louisiana. At least, that is where I would locate it, if I could guess.

24—time This is a picture of a public square, which I will guess to be in London. There is some snow on the ground. It is a wintry day. There are several small trees—oh, not too small, perhaps; they're higher than the lamp posts. In this public square which is triangular in shape—at least, the view that we have of it is triangular—two streets coming in from the left and the right meet at the upper right-hand corner of the picture, and as they meet, a bright street lamp of the kind earlier described is shining. The square is enclosed in a high iron fence set in a rock or concrete base, and in the square there are three benches visible. These are benches of a rather strange type with a back



running down the middle, two seat boards on either—one seat board on either side, so that approximately eight people could sit and leaning against one back, four on each side of it. Three such composite benches are to be seen. There is another street lamp in the lower center of the picture, almost in the foreground. The lamp in the foreground is casting quite a bright light on the snowy ground right at its base and in a circle around it. There's another street—two other street lamps whose light is seen in the picture, but the lamps themselves cannot be seen, one in the dis—extreme left, one is at the extreme right. By the way, there are not three such benches as those described, but there are four, two on each side, arranged parallel to the walls of the triangular—of this triangular public square. The shadows are rather interesting, because the placing of the street lights makes shadows go fo—in all directions, that is, each light is shining in—from a different angle upon the various vertical objects: the trees, the benches, et cetera; and as a result, there's a very interesting all-directional shadow. The benches—some of them show shadows in two directions. The lamp post at the very center of the picture shows a—throws a shadow which goes in four directions from the lamp as a result of the light shining upon it in all directions.

Across the street from this public square on the left-hand side is—are a series of buildings, houses of the old world type, that are built directly against the sidewalk with a very narrow sidewalk and an exceedingly low curbing. There is a sidewalk on this—on the near sides of the street, that is, a sidewalk just outside of the fence surrounding the park. The streets are paved with cobblestone and also are continental and old world. The trees are protected from damage from visitors to the park by virtue of a little round basket—well, set of small pickets set around each tree and reaching up to, I would say, about a height of four or five feet, apparently to keep children playing or others from cutting their initials in and damaging the—these particular trees. It is these signs of very careful care; the cobblestones, the con—continental atmosphere, and the pattern of the lamp posts that make me identify this as very likely being a London park. Also noticeable is a series of small shrubs along the picket fence on both sides of the park. And, some-

how or other, this, too, has an English look. That's all. No, one more thing. There have been many people in this park to-day. The snow is messed up and there are many foot-marks—footprints going in all directions, showing that this is a quite popular square. That's all.

30—time This is a very interesting picture of some form of non-literate art. I rather think it is woven, although the motif does not one—is not one which I would expect to find among a people with that particular motif. It looks like a photograph from some sort of thing such as a blanket, per—as the type with which we usually—the type which we usually associate with Navajo, or with a Chillcot blanket of the northwest coast. However, the subject matter is quite clearly African. The—as a matter of fact, the—it is a picture of an animal in an angry, attacking position. The animal, I think, is a gorilla. It is entirely done in sharp blacks and whites with shading attempted by rather broad white lines which, of course, is one of the things which gives it the appearance of the art of non-literate people. As a matter of fact, this is so studied that this probably is not non-literate people's art, but the—the—a expression of a person from a more complex culture who is imitating or capturing what might—he might regard as the spirit of the art of a non-literate people.

At any rate, this gorilla—it is a gorilla. The length of the arm—the left arm is placed on the ground with the fingers outstretched so that the palm of the hand is flat on the ground. The legs are short and bent sharply at the knees. The feet very flat, with a heel which extends out in back of the foot very noticeable. There is a high degree of prognosticism in the face. The skull is high, pointed, and narrow, which is—which could possibly be that of a gorilla, though I think there is perhaps a little too much foreskull here for it to be very accurate representation of a gorilla. The right arm is raised with the fist clenched. It's bent backward at a rather awkward angle as if the figure in the picture were going to strike a blow outward and downward with the clenched fist. The white background against which this figure is in relief seems to be a white section, as I said before, woven into a darker background which I take to be a woven fabric of some sort. The lines of the black and white as they

interlace, that is, of the two backgrounds, also carry out this black and white pattern of the approaching of shading which was previously mentioned in the figure itself. That's all.

#### SUBJECT WO

38—time Well, it wasn't so old. It is a typewriter, and it's a telephone that they have. It's a newspaper office or something with a story or—or—Boy, the one in the back looks almost like the pictures of the gangsters with the dark lined faces and thin—and the way the angle of the hat—It's a newspaper office. You can tell by the newspapers all scattered around—newspaper room, sort of, seems to be. Maybe it's just a—somebody interested in a big story. But, anyway, it looks like the movie version of a—of a busy newspaper office, with everybody madly getting a story. And the phone buzzes and—typing out a story, and the newspapers scattered around. Oh, even the additional phone gives it some appearance of a busy newspaper office.

#### SUBJECT LI

25—time It's a picture of a railroad yard. There is a coach on the right. There is a shack on the left. There are con—or fabricated steel structures going up which are used for a control light. The picture apparently has been taken from a control tower, and the window has reflected into the lens, acting as a mirror, and has given a large part of the yard which isn't in actual view to the lens of the camera, thereby causing a transposition or covering up of one part of the main picture with another picture, which would be the mirrored image by the window to the lens. The window apparently was closed, or there were bars on the window, as the—no, the window was closed. It must be closed, because the reflection would have to come from the glass of the window, and there are streaks through the net portion which are clear, that is, giving a clear view of the yard per day as would actually be seen by the camera. Therefore, these are the window rods; therefore, we know that the window is shut!

#### SUBJECT MO

37(A)—time Yeah, there is. Now it looks as if it might be in Kansas—a scene in Kansas,

but the architecture of the house suggests Europe. There is a door on the side, and your sky very monotonous, so that—and there's a lake or something down there—a river. I would be inclined to say that it's Dutch or Scotch. The peak of the house is a little too high for Scotch. Maybe Irish. And it doesn't seem to be a road running in front of this at all, but just an old cow path. Clothes on the line. Generally, a very bleak-looking scene—a very cold, damp-looking place. Rather hopeless situation. Anybody that was born there had the cards stacked against him. That's all.

Meaning appears assured by the time of the interpretative stage. *How* that interpretative assurance is derived is, of course, another question. There are many examples in the protocols to show that, even at time exposure, some material still prohibits interpretative manipulation; and when such instances occur, the subject must fall back on less developed processes which characteristically belong earlier in the sequence. Subject Mo, on Slide No. 26, tried his full repertoire of transitional mechanisms and, finding none steady enough to hoist him onto further elevations, rejected the material as out of bounds from his experience:

26—time Well, I don't know what it is. I don't know what it is. Can't imagine what it is. Looks to me like it might be in a cave—as though there's stalagmites and stalagmites. On the other hand, the stuff that's hanging down along the edges, that what looks like a stream, seem to be jelly-like. It may be a picture of some kind of an animal in the ocean—don't know the animals—jelly-fish like things. Looks like fungus growing on that what looks like the branch of a tree. We have ferny growth in the upper part of the picture. It looks like a brook or a stream or something. I don't know what it is. It doesn't remind me of anything. It's a new thing, I don't know what it is. New to my experience. I don't know what it is.

Subject Pi, unable to find a form that

would fit, finally refused any kind of interpretation at all:

50—time It's a picture—a double exposure of a man or—in some way. I—he—or at least there's some arms, and there's a leg—two legs down the center. They might be a Siamese twin (laughs) of some sort! I don't know just how the picture was taken. I believe it must be superimposed, though. There are two arms held out. They're quite a bit darker. The dark spot I saw in the center seems to be a head of some sort. Oh, I know what it is, I think; it's a shadow picture. A sheet up in front, perhaps, and the arms are sticking out beyond the sheet, and we see the part behind them, although with—if it were a shadow picture we wouldn't see the crease in the trousers or the different stripes in their shoes, and so on. It's a little peculiar. I don't know quite what it—how to explain what it is. The dark line I saw over at the left seems to be tent pole, and half of the picture is quite dark.

Subject Fu, not entirely satisfied with the fit selected, dragged back the sensory data once more to reaffirm her attempts at interpretation:

11—time This face looks as though it were behind a veil. However, not a veil that was on the face, but as though someone took a picture through a veil. And that was what gave me the idea that there were scars or something on the person's face . . . design on the veil—flowers and leaves and stems and things like that. And on the right-hand cheek it just so happens that there are quite a few stems that are across the cheek which, at the first look, would give you the idea it was scars. And the eyes are looking—well, they're looking straight at you. They're rather large eyes and with sort of a starey gaze in them. And this looks like a woman. However, it might be a man, say a dancer who is made up quite a bit for a ballet or something like that. And what gave me the idea that it was diamond-shaped was that this person has a turban or something on her head. You can't tell; it just looks all the same degree of darkness, but it comes together in the center on the forehead and branches off to the sides. The person's face is more pointed at the chin than it is—it's not a square face. It's more

diamond-shaped, and that's what gave me the idea.

The person isn't smiling, but their mouth is rather tightly shut, and they look very serious, as though they were dazed, or something—the way a person in a daze would just sit and look and stare straight at you, or something like that. And the lips look as though they were heavily made up, as though it were thick lipstick, or something. The lower lip is whiter than the upper one in the picture. The light is shining sort of from the upper above from the left-hand side of the person's face. The cheek bones are accented by light as is her nose, and the forehead is, too. And on the forehead is a—well, the design on this veil is—or whatever it is—this kind of picture looks like a sort of a silly figure that would have no body but just arms extending from the side and then real long legs, and then the little white part would be the head. Underneath the chin is a white blotch. I can't tell exactly what it is. The reason why I think that this—I mean, the reason why I gave the impression that—a diamond shape is because the light part in the picture is diamond-shaped. This person has on their head some kind of a turban or something. However, you can't see any folds or anything. It's all equally as dark. And the turban goes in to a sort of point in the middle of the forehead. It's not quite in the middle; it's over to the right—I mean, the left-hand side of the person's face, and goes down to the side down below the eyes, back on the right-hand side of the person, crosses a little bit of the person's eyebrow, and then this person's face is diamond—tends to be more diamond-shaped, even though the chin is quite a bit narrower than the cheek bones. And another thing that gives the idea is that the cheek bones are highlighted in that the chin is, and the nose and that tends to concentrate your attention on the light part, which makes you think that it's quite a bit . . .

The role of the sensory data, by this level, seems quite apparently diminished to that of cue reduction, and very little more. Subject Fu, as an example, on Slide No. 5, identified at 4.0 the left-hand object as a clock "because I think I saw figures around on it—something around



it, dark figures on a white background."

The same subject on Slide No. 1, at time exposure, identified apples with a little stem coming out of them; "that's about the only way you can tell what they are."

The IF series of Slides Nos. 17-22 were evaluated as easier by many subjects because they eliminated the necessity always present in the OF steps to find *something* to start working with. Subject Da observed how interesting it was to watch distances shift from flash to flash because she utilized the smallest of cues "to push a building around as much as fifteen feet." Subject Re, at the end of time exposure on Slide No. 44, reported on the various cues which he had checked off as he arrived at a final interpretation of "dandelions:" the leaves were too tall for mushrooms; he was personally familiar with dandelions because he had often gathered them for his father when he was younger; the height of the plant from the ground ruled out chrysanthemums.

Obviously, however, there is some selection among cues, and those retained seem required to be compatible with remembered experiences, which will be discussed at more length under memory influences. Suffice it to note at this point that once a satisfying form is achieved, other cues may actually be dropped from any consideration. This is superbly demonstrated on Slide No. 13, where a number of subjects recognized and reported that the sign in the lower left-hand corner read backwards, indicating that the entire slide was being viewed in reversed position; but not a single one of the total of 18 subjects who saw that slide reversed the figures in reporting the time on the clock. Instead, the hour and minutes were, in every instance, named on the basis of the customary time which such straightforward position

of the hands would indicate. Subject Zo, in dealing with Slide No. 11, reported:

11-3.5 Now, the impression that I got was of a human face, and I'm not exactly sure of that, but that is what it looked like. It was dark all around that, and the lighter spots seem to be in the position that might indicate the cheeks, whereas the hollow spots would indicate the mouth and the eyes and the shadow cast by the nose.

#### SUBJECT DA

v37 (B)-4.0 This time I got several triangles going down almost as if I were seeing a slide upside down, and this ap—this triangle was the—well, there's a triangle that's formed by the sides of a roof going up on a house. What this slide probably is is the slide that I saw before.—

#### SUBJECT KU

39-3.5 —It changed, so that it looked like she had two eyes. She did before, but they were in very unrelated position. One was way down near the bottom, and one was way up near the top, and it looked rather gruesome. It looks as if it were the same individual, only she'd been shaken.—

Slides Nos. 23(A) and (B) illustrated particularly well the dropping out of positional cues as soon as they became non-functional, for here the positional interchanges were experimentally controlled. In all, only two of the observers, Subjects Re and Ta, were able to carry both positional changes and identification simultaneously. Four others, Subjects Fu, Zo, Li, and Hi, gave up the positions until the interchanging coin and pin were acceptably identified, whereupon the positions were once again picked up and acknowledged. Subjects Bo and Mo—and particularly Mo—, intent from the first upon prospective identifications, ignored entirely any mention of the changes throughout the whole series. All of the remaining observers, once some semblance of form specification was found feasible, abandoned any further reference to the fluctuating locations.

## CHAPTER VI

### ANALYSIS OF RESULTS: ACCESSORY PHENOMENA

#### PERSISTENCE OF SET

THE cues which the OF flashes supplied led often to interpretations before the point of time exposure; and when the interpretative deduction was adequate for the perceiver—whatever the explanation for the adequacy might be—it sometimes occasioned astounding continuations of entirely erroneous percepts which were not interrupted until clear focus or time was reached. Slide No. 28 was particularly provocative of this sort of treatment, especially in connection with the angles of regard and the amount of perspective utilized.

#### SUBJECT RE

28—time It's amazing!—There is a complete reversal of the plane of the building for me throughout all of these, until I saw this last shot. On all the others the building seemed to go from front right to back left, while in the original actual picture it goes from front left to back right. The angle also seemed to be a good deal sharper as I saw it before than it is now, receding a good deal more quickly into the background.

#### SUBJECT PI

28—time What I saw as the picture seems to be entirely different from what is it.—I thought the house was turned in the opposite diagonal from the way it does in the picture. It's the wall we're looking against here, but I thought the house faced in the other direction and the rest of it was ground. I didn't see the tree.—

#### SUBJECT LI

28—time Oh, gosh! I was right about the sheets, but that's about all! The black in the foreground is merely a partition or line on the lower part of the building. The windows were not seen at all, and what was taken to be grass is the side of the building where chunks have been knocked out. I had

a definite feeling that there was a drop off from the hill behind the part that is cut off from the bottom part from the top of the house, and I see no reason for it, excepting there there seems to be a slight rise in the foreground and may be a length of shadow.

#### SUBJECT JO

28—time After looking at the picture for a second or so, the—my perception of it changed, so that the wall which previously I had seen running at an angle, the lower corner being in the right—the lower right quadrant of this slide—I've forgotten how I started this sentence, but, any rate, now the corner closest to me is in the lower left-hand corner of the slide instead of a little above the corner, on the right-hand side.—

#### SUBJECT MO

28—time Oh, it took me a long time to get my eyes focussed on this—a very long time. I couldn't imagine for a minute—the camera so close to that wall. Bare ground. The ground is level. I thought it was sloping.—The cracks in the wall reminded me of a cliff.—

There are other examples, also, in the protocols which illustrate this tendency for set to continue:

#### SUBJECT HI

8—3.0 This time there appeared to be color, orange—mostly orange and blue. There may be red and brown in it. The center of the object looked like some sort of a bird perched on a tree. The other objects were trees around this central one.

—3.5 This time, the observation same as last, except the bird was larger, and the neck of the bird was a light tan or white. Rest of the bird was dark brown or black. It may be an owl.—

—4.0 I could see the bird more plain this time, and it has a rather long neck, although not skinny neck. And it's still white or light brown, the rest of it black or dark brown.—

—4.5a Oh! It's not a bird but a tower.—

## SUBJECT JO

46-time —I was completely out of perspective here, since I was oriented toward a view of the landscape instead of a close-up of part of it.—

## SUBJECT CI

35-time I was tempted before to say Mirror Lake, but this isn't the location I had in mind.—

## SUBJECT RE

15-4.5a The scene of a lawn with a house in the back left, extending over a little beyond right center. Instead of a fir tree now, there are some ivy vines which are very brightly lighted in the sun coming from—ah, I'd say about 11 o'clock above, clinging to a house on the right-hand side. Contrast is very sharp now.

—4.5b Same view, even brighter, and it seems to be some kind of shadow of the ivy blowing upon the lawn. The sun now seems to be turning to about 2 or 3 o'clock, rather than 11 o'clock.—

—4.5c Same picture, even clearer. Some of the grass right below the ivy is very distinctly seen.

—time Huh!—

Subject Da, who had several continuations of incorrect predisposition, showed a characteristic tendency to perpetuate these attitudes, even in the time exposures where no inspection of the data could possibly encourage the interpretation:

42-time One point which might be interesting to describe is that, even though at the very beginning I said this diagonal was slanting in a way, it is slanting. Still, in the last slide I had the impression somehow that it was almost slanting the other way, that the deck or whatever it was, was running in the opposite direction; and yet I know that the edge of the diagonal wasn't. The water still seems to be going in the circular pattern. I think there are many of these blotches of sunlight are larger than I thought they were. And I wasn't cognizant at all of this string—these ropes, or whatever, which are running through the center of the picture. I didn't notice those.

43-time Oh! Well, well! (Subject Da) missed it by a long shot there! These shells were never in that shape. They always seemed much more circular and much more clearly defined, so that it looked like sunlight coming straight at me through some hole. And I can see where I got the idea of the head. It's—under this blanket, probably using this—this bowl of the pipe which is lying across the fishnet. The feathers I didn't see at all. And, in fact, the background beyond the shells didn't seem to be the same background that I see in the foreground.

49-4.5a I don't know why, but this time I got an impression of a study, some sort of a library where there is perhaps a big table there, and then over to the center in the right, up against that table, is a great big armchair which is sort of three-quarters of its back to me, so I see its back along a line along the right and then this arm and side along the line of the left. And someone's sitting in the chair. There seems to be smoke curling up from the chair—someone smoking. And a background of shelves and perhaps a fireplace. There are a lot of little lines which are straight, which made me think of book shelves. It's a very dark picture, but I did get that impression of a library scene.

—4.5b Well, the impression of a library scene has remained. It may be another one of an automobile overturned, or something. There—there are a lot of lines in this which are straightish and in a pretty complicated structuring.

—time Well, that was a long way off. And yet I can see—I can reconstruct the scene. This light line of reflection on the water which is just a little right of center. And there's dark green—a darkish green, and then a lighter, whitish under that grey. That was what I was looking at as the fireplace. And these mass of brown and the center part of these, and the lilies which are in the center were more or less the table. And this outline up here of the reflection of the little platform, or whatever you call that at Mirror Lake, is the armchair. It's moved up higher, but it—I can definitely see two sides of that fireplace here. Even now, knowing it's water, I get an impression of one side and another side, because of the shading. Didn't notice color before at all. And this white down here in the lower left—lower



right corner—didn't notice that. And I didn't notice these sort of white blotches over the white rocks up at the top. However, when I compare it with my first impression of first couple of these corner blotches, it fits in very well with that.

Whether this tendency is to be explained as rigidity against break with the set or merely as a rationalization for its persistence is perhaps debatable. At least the practice is evident in several observers.<sup>42</sup>

#### SUBJECT H1

45(A)—time Actually, the object isn't as I had seen it.—the shadows from each of these three buildings gave me the impression of another building which would be the three.—I had this [tree in the background] tied in with this shadow from the wing in front of this. Also I saw this road nearly as it is in the foreground. However, I didn't see it turn in to the building.—

The most classic demonstration of persisting set came on Slide No. 40 where the skull formed so early in the series that by the time details came in at clear focus, very few of the subjects—as a matter of tabulation, only one who was not previously familiar with the picture—caught the masked effect. However, the trick was repeatedly pronounced as clever, and no observers voiced any objection against it. Subject Zo, at the end of the time exposure on this slide, commented that she had experienced a peculiar sensation upon discovering something other than the expected skull. She added that if she had seen the long-time exposure first she would never have been able to get the skull effect.

<sup>42</sup> Smith (97, 328) found among his younger observers a similar tendency to carry sets or attitudes in interpretation: "It is interesting also to note that many young children . . . persisted in the same interpretation when they saw the picture properly at the end of the experiment. Here the mental factors at work were apparently much stronger than the visual sensations which were responsible for the process."

#### FIGURE-GROUND SEPARATION

On the basis of the present study, figure and ground could be defined as units of sensory data which are required to differ only in degree of light intensity sufficient to constitute separate forces. Or, put yet another way, figure-and-ground status is simply an optimal degree of contrast between adjacent regions of lightness and darkness. Subject Fu was particularly sensitive to these contrasts, and made many comments regarding them:

1-4.5a The outline's becoming clearer. I can see more light spaces contrasted between the dark and the white, and—I could see them better.

3-4.0 It still looks like a design of black and white, with the black and white mixed up throughout, but there is a difference between this one and the last one in that the black and white stand out more mixed.

6-4.5c Now I'm beginning to wonder if the part at the bottom could be over a city. It doesn't look as much like water and the sky. The clouds in the sky are becoming more distinct. They don't look so much a part of each other. And in the bottom there are some quite dark and some quite . . . and they're also quite—very light ones.

11-2.0 —They're sort of hazy lines; sort of blend into each other. But you have the impression that there is a contrast between light and dark.

14-3.0 —The distinction between the light and the dark is pretty definite.

43-3.5 This time the lower oval looked a lot darker than it had—did before, though not—it wasn't solid. In fact, very seldom in any of the pictures, when I first looked at them, did any of it seem solid. Maybe the first time because the light and dark were so close in color that—well, the grey looked all grey, and the white looked all white; but as soon as you could see any outlines or anything, the dark and the light don't look completely that way. They seem to have—well, if it's a dark background, it has light, even if it's just sort of blurred into—in the—even if they just seem to blur into one another. And the top part looked—you keep

getting the feeling that it was—oh, a figure or anything, because the dark and the light are so distinct that you feel like they're separated, and not just light shining, or something.

The experiences of Subject Fu would prompt the conclusion that emancipation of figure from ground raises figure to a foreground position and depresses the groundal portion. In view of her protocol accounts, one is led to wonder how similar are this phase and the perspective analogies referred to at the transitional level:

11—0.0 This just looks like white and dark. I don't have the feeling like I usually do that the white is on the darker or that the darker is on the white; but they're just sort of blended in together. And from what I can tell this time, it looks as though this white part—white, greyish part—was longer from top to bottom than it was from left to right.

43—3.0 This time you could—in this upper oval shape I could see a light part—well, over towards the right. And then around this were—oh, sort of dark background, sort of halo effect—well, not as round as if it were a halo, but that had a feeling, with white in it—white sort of bars, so this bar—the white part seems behind the dark part. And then the rest of the picture seemed to be dark, and the white just stood out more distinctly.

One question was aroused by the lack of consistency among subjects in naming the dark areas for figure. Subject Ci, for example, commented:

29(A)—time —I seem to notice the bright parts of the picture always are easier for me and attract my attention much more than the darker portions.

29(B)—3.5 —It seems that I'm always drawn towards the lighter portion of the picture.

Yet his more elaborate comment on Slide No. 16 would indicate that this preference for the light held only so long as the early sensory situation was predominantly light instead of dark:

16—2.0 Now—it always takes the time until the dark part comes out as the real picture part, whereas at first, when it's undifferentiated, the light seems to be the prominent feature. Then, the dark reverts as it does now, and there is a building or something in the center with a . . .

By far, the majority of observers who made any mention of the light-dark distinctions showed a tendency to concentrate on the darker areas. Subject Jo, because she ignored the white sections of Slide No. 26, missed the emerging form for an unusually long period. Subject Wo had the similar experience of missing the bridge form in Slide No. 12 because of intentness on the darker parts; and it was this subject, also, who remarked that the dark parts generally attracted her first, even the darker center of the penknife in Slides No. 23(A) and (B). Subject Fu once queried, "I wonder why you always feel you see black on white instead of white on black?"

The present data are not sufficient to carry that question further. The only indications which they supply toward an answer are references from Subjects Li and Da to the experience of figure-ground reversals, and tendencies observed throughout the records to anchor form to areas of sharpest concentration, whether the intensity there be lightness or darkness.

#### SUBJECT CI

26—4.5a—There is something on the extreme left which I'd like to recognize, but I seem to be drawn toward these dark points.

#### SUBJECT ZO

16—4.5c—In the center there is this one object which is becoming much darker, while the others seem to be fading away somewhat. The attention is directed to this one particular object.—

#### SUBJECT FU

29(B)—4.5b—And one thing I find with

the pictures is that once I can see a—think I can make out one part of the picture, in spite of the fact that I think I'm concentrating on the middle of the screen, but I tend to concentrate on the part that I could see most distinctly the time before and sort of—one thing leads to another—I mean, I saw it most distinctly one time, so the next time I'm more or less conscious of that, so that time I see it better than the background, too. And I think that that's why I don't pick up what else is in the background more than—I think I would do it more if I saw, say, this time—if I'd seen it—this was the first time I had seen the picture at all, I might have gotten the whole picture more than I do, because I've seen other ones before.

It was one of Subject Ci's objections to the IF series of Slides Nos. 17-22 that the first flash drew attention to figural parts, and, once established, virtually forced the observer to return to them on each ensuing flash, thereby eliminating all opportunity to move to other quadrants and to round out details. For him, as a consequence, the background was always harder to obtain than figure. Subject Da, intent in Slide No. 36(B) on the emerging figures in the foreground, lost for a great many flashes the recurring background which was the most logical source of identification with the (A) version shown earlier.

On one important score, however, the present records leave little debate, that is, that figure and ground separations may be established and acknowledged long before meaning has been consummated. This seems eminently significant and can imply only one conclusion: that figure and ground distinctions mark points of progress of a transitional character and are essential to the end achievement of form; but form and meaning are not necessarily coexistent, and until a form pattern is derived which satisfies the established standards, interpretation, and hence meaning, will be withheld.

An examination of representative protocol excerpts may amply verify this implication.

#### SUBJECT Zo

34-4.0 They're—well, they're still very hazy, but this object is quite sharp, and—although I still can't see what it is.

#### SUBJECT Da

26-4.5b—I seem to be seeing it fairly clearly, and yet I can't organize it, or recognize that it's anything, which makes it very hard to describe.

34-3.5—And the rest of the slide, even though I could see it clearly, it—it just means nothing, so that I have—I can't describe it. For instance, this left-hand side—there is some darkness down at the bottom and some light through. But no organization at all. It's very difficult to describe this thing.

#### SUBJECT Fu

42-3.0 This time I could just see it more clearly. I couldn't tell any better what it is.—

#### SUBJECT Re

16-4.5a—There's a great deal of clarity in the picture, but I can't tell what it is I see shown clearly.—

25-4.5c Just as clear as before, but I can't make out any more. It looks like I know what it is, but—I don't know what it is.

28-4.5a Very clear view of something.—

34-4.5a Very clear picture of I don't know what.

—4.5b Again quite clear, but I can't make out exactly what it is that I see.—

39-2.0 Fairly bright scene. The whole thing looks like a close-up of something. Why it does, I don't know, except that there seems to be one large unit taking up most of the frame and has the inhomogeneity of the uniform surface. I don't know if this makes sense, but that's what I mean.

#### SUBJECT Pi

35-4.5a The picture is pretty clear. The outlines of the objects seem to be in focus, but can't quite make out.—

50-4.5a The edges are quite definite. I can see quite clearly what they are, but I



can't see what the picture is. It doesn't mean anything to me.

#### SUBJECT HI

10-4.5c The object is very sharp this time, but I still can't grasp it.—

25-4.5a It was very sharp this time, although I didn't quite catch it.—

47-4.5a This time I think I saw it, but I can't exactly identify it.—

#### SUBJECT BO

25-4.5b This time I could clearly see a picture, but I cannot make out what it is.

26-4.5a This time I saw a—quite a few light-dark areas mingled in forms. The picture was very clear, but I couldn't quite make it out.

#### SUBJECT JO

10-4.5b Well, if I knew what it was, I think I could say it.—

14-4.5a I saw it, but I've no idea what it is.

-4.5 This is the kind of picture that's so discouraging, because you can see it, but you can't say what you see, though it still looks like what I said last time.

v14-4.5a Uhm, I saw this very closely, but I've no idea what I saw.—

24-4.0 Well, this time I think I saw it rather clearly, but I can't decide what I saw.—

31-4.0 Ah, I feel more distinctly than ever there's something wrong with the picture, because it's quite clear but I still can't organize it into any definite object or scene. Reminds me of wha—that scene with all those worms in it, upside down.

48-3.5 I saw it more clearly, but it doesn't fit into any pattern, so I can't identify it.

It was subject Jo at the end of the time exposure on Slide No. 48 who said that it was just as she had expected it, despite her descriptive inadequacies; and Subject Wo, after Slide No. 24, who commented that it appeared on the time exposure exactly as it had before but that she just had not been able to do anything with it.

The reports on Slide No. 17, because

it was viewed continuously at IF exposure and because the content was unusual, were rich in illustrations that figure recognition and meaning are not synonymous.

#### SUBJECT WO

17-4.5a I actually saw something that time. Oh, what could it be? Sort of looked like a gate or something with crossbars on it, with something right in the center, either suspended from a gate or sticking up on a gate. Maybe it wasn't a gate. Anyway, there was light behind it—this dark shadow of the gate or the darkness of the gate in the foreground.

-4.5b You can't tell much more now. And there's sort of something round in the front, and then there's something solid up on the left-hand side, again. And the side bars of the gate, or whatever it is, go right up, very high. Then there's a lower middle section.

-4.5c Well, I don't know. Looks something like a bell in the middle, and then looks as though there's another one facing the other way behind it, a little to the left.

-4.5d I can't tell any more about it. I can see it plainly, but I can't tell what it is (laughs). Maybe I ought to draw it out. (Drew).

-4.5e Well, I can't tell what it is any more, but I can add some more lines to my picture. (Drew)

-time Well, what is it? A—I don't know what it is now. Oh, it's a—sort of a—something that goes round—what would you call it?—like you have on a—a mill. I don't know what you call it, Annie; I'm stuck for words! Anyway, this thing looks as though it goes around. The rest of it, I don't know. Well, if that isn't queer! Where did you find that?

#### SUBJECT DA

17-4.5a I saw it pretty clearly. There seem to be two dark round balls on a framework, which is also dark, but I can't decide what it was. It looked a little bit like a framework that you might find in a gym, with big balls hanging onto it, but it was a very clear impression, the clearest I've had so far.

-4.5b Besides the two round balls there also seems to be a bell on the left side—the

balls are on the right. And the framework, I said before, was an X. And it seems to be that, with borders on all four sides of that X figure. I still can't recognize it as something I know, but it's very clear.

-4.5c Still no recognition of what it is, but the details—it seems a little wider than it was before, with perhaps an extra rung down at the right-hand side. I'm not sure of that.

-4.5d Still this perplexity as far as recognizing it as something I know. The round objects seem to be getting lot—they are a little larger and a little closer together, and they're moving down more than they were at the very first.

-4.5e There may be a little more tracery in it than I realized, but I'm not sure of it. Still the very, very clear impression of a sort of framework against the white background, but I can't—can't recognize the framework as any definite object.

-time Well, I still don't recognize it (laughs). The—I see a ball which is on a mirror, and there are two mirrors joined, evidently one which is perpendicular to the ground and the other which is on the ground, so that the ball has—I've changed my mind, because if it were these two mirrors, you wouldn't see the reflection at the joining of the mirror—in the mirror which is parallel to the ground. I can't figure out quite the relationship of the mirrors. I know there is a mirror on the first section of the mirror, because you can see the reflection of the ball and the reflection of this grillwork. However, in the background, it's very difficult to—for me to get the relationship there. There seems to be a mirror, but exactly how it's placed so that the whole reflection of the second or more distant ball is perceived, I don't quite understand. I don't get this—well, it looks like painted bricks, and yet it has a transparency over at the right-hand side, so that I'm—I'm still puzzled by the picture. I can't get anything out of it clearly at all.

#### SUBJECT RE

17-4.5a Was that in focus properly? Looked much clearer than any of the others. Very clear, not at all hazy as the first of all the preceding series have been. Two sets of horizontal lines, apparently five to a line,

sort of like the lines in music. And across the lines there seem to be staves—treble. However, there also seem to be some rather solid object on this, but very highly lighted. It may very well be something across that looks like a plate.

-4.5b Still very clear, but looks different now. Looks like an hourglass sort of arrangement with horizontal lines within the beam of each half of the glass and these large buttons on the front of it. There seems to be a mirror and the reflection of the figure upon the mirror or else there's a plate glass, and some distance on the other side of the glass there is a replica of the figure in the foreground.

-4.5c Still very clear and bright, but I'm not at all sure of what I'm seeing now. Still looks like a large plate glass with the arrangement described previously on them.

4.5d Still looks the same. I just can't make out what it is.

4.5e It again looks like something pasted onto a glass plate at some distance beyond it. The same figure, very dark border on the plate glass itself with a large button brightly lighted. However, it looks just like a pattern, and no regular form in terms of a real object can be seen.

-time Bowling ball resting on a black surface against a grillwork which projects at 45° angle out from the base where a horizontal mirror—rather, a vertical mirror, joins the base mirror. In the vertical mirror is seen a reflection of this figure. The reflection of the grillwork makes it look like a panel. I saw that exactly as it was from the very first. Very sharp black and white contrasts.

#### SUBJECT CI

17-4.5a It's something of a steel construction. It has horizontal bars and wires and two black round objects that approximately top left and centers over to the right.

-4.5b The round objects look like spheres, and near to them there are some—some bars close together, so that they look like grill or a grate.

-4.5c No progress.

-4.5d It could be a view of some tracks—railroad tracks, with the lines from above. I'm not getting any more.

-4.5e It looks like a window, so that the

symmetry on the picture is accounted for by a reflection—a mirror-like effect.

—time (Long pause) I cannot determine what it represents. I notice that these lower spheres are—were not visible from—on the short exposures.

#### HUMAN MOVEMENT

As has previously been explained, it early became evident, in inspections of the protocols, that reports of movement in perception were probably due more consideration when they appeared without the justification of sensory stimulation than in the slides whose content at long exposure easily suggested the posture for activity. This was largely true because of the telescoping which has always occurred by the time a long-period exposure report can be given, and because the problem of the present study is phrased in terms of minimal and transitional states rather than fully developed ones.

In accord with this preliminary observation is the frequency with which human movement responses are to be discovered in slides with content foreign to activity, and particularly in OF steps where form may not yet have been stabilized.<sup>43</sup> This is not to indicate, however, that form is precluded in movement answers. As a matter of fact, forms apparently are tendered first by the observer, whether of a transitory or interpretative character, and to these movement seems to be appended as a constructive detail. It is difficult to emphasize too strongly here that the implications for human movement, on this basis, classify

<sup>43</sup> This is in close agreement with the findings of Kolligs (62) who, in varying the light intensity with line drawings, observed that the perception of motion bore a direct relationship to strength of the stimuli. More motion was reported by subjects when the stimuli were more difficult to perceive. Kolligs supposed this tendency to be due to subjective forces which interfere with other reactions to the stimuli.

it definitely as a highly developed type of interpretation far excessive to anything warranted by the sensory data alone.

#### SUBJECT DA

28-4.0 That time I got the impression of someone lying on the ground with their head up against the wall. But that was very hazy.—

—4.5a Again, this definite impression of someone lying on the right-hand side, and someone nearer me lying on the left-hand side, somewhat at an angle to me.—

—4.5c Again, this same impression of women lying down. And I could almost see—they're sort of lying on a side and on their backs, and they have a hand folded under their heads so that their elbows stick out.—

48-3.0—It's almost as if there's a little horse over between the center and the right-hand side. And then there's some figure between the center and the left-hand side, but that's very impressionistic.

—3.5 Well, I'll continue with the horse. This time he's moved more to the center of the screen, and there seems to be a rider, so it looks very much like a horse race where you have this jockey up from the saddle, a little in mid-air.—This horse seems to be riding along a wall, but I don't know whether the wall is in front of the horse or behind it.

—4.0 Well, this time I didn't get the movement of the horse that I got before. Thing seems to be very stationary. I'm not sure of the horse. The trees in the background stand out very clearly, but the foreground is sort of a mushy shading.

#### SUBJECT MO

15-4.5a Now it looks to me as if over on the right we have a bunch of people. It seems to have been taken from above, and we can see the tops of the people's hats. And they seem to be concentrated and in—sort of looking in one direction. They seem to be on a pier. The picture might have been taken from a steamer—a steamer. When it comes close to the docks, the sides rise like a cliff. Somebody standing on top of the deck took the picture of those people on the dock. Now, I don't know what kind of people they are. They might be natives. I don't know who they are. That's what it



reminded me this time, of the sun shining on their hats. O. K.

-4.5b Again we get a suggestion of people. This time they seem to be rowing. They may be in a big boat, and all of them are using oars. There's an awful jam of them in the boat. I don't know what in the hell they're doing, but they're there. That's about all I can see this time.

-4.5c Again I get the feeling that there's people there, and a lot of them. Probably we can see about forty people in this shot. You see some of their faces this time. I still don't know what they're doing there. I can't figure out anything in the ground. I just see the field—anything—I just see the people, but I don't know anything about the background. I can't figure it out.

48-3.5 Looks to me as if it might be a man on a horse—a race horse, and going toward the left. Might be a picture of a track—race track, and somebody on a horse, I think a jockey. The horse is running. I think that's what it is—a man on a race horse, a black race horse.

-4.0 It looks more like a race horse now than anything before. In the background we can see something that looks like a grandstand, maybe on the other side of the track—the opposite side of the track, the track being circular. I think it's a man on a horse—a race-track horse. I thought I saw the jockey's hat with the peak. That's all.

#### SUBJECT YA

46-4.5a This is a—this is a picture taken—I would say not—there's no foliage in the background, but seems to be a picture taken of the barnyard out of the inside door. There's a man squatting down in the background doing some sort of work in the—in the—what I take to be a barnyard.

-4.5b The man is standing. He's not—he's not stooped at all. But otherwise, the picture is the same.

—time For heaven's sake! No man at all!—

#### SUBJECT NA

46-4.5c The object looked like . . . , and there is a man probably kneeling on one foot and a round object before him.

#### SUBJECT RE

35-2.0 Quite obscure as yet. Somehow or

other, to the right of the midline, there seems to be someone walking. Why, I don't know except that it looks like a trunk with legs. That's about all.

-2.5 Even more clear. Looks like a picture of a man walking. Scene is taken from rather low down, I should say about knee height. Seems to be walking on a sidewalk. On the other side behind him there is a side of a building. However, there isn't very much contrast. The light is quite diffused.

-3.0 Still looks like a man walking, walking from my right to my left. Seems to have his right arm extended out before him, reaching for a pole of some sort. I'm really not at all sure, now, that it's a man that I see . . . an extension of the other observation. It's still quite diffused.

48-3.5 No, it's not an upside-down picture. Looks like a man in a hat pushing some kind of wheel barrow, or riding a rocking horse, or walking behind a plough. Lower part of the frame still seems to contain all the form and all the darkness.

-4.0 Looks like an old-fashioned picture, Currier-and-Ivish quality, of a man riding a two-wheeler drawn by a horse.—

49-3.5 Looks like the indoor scene of an office. People seated at desks and most of the shot being taken over their heads so that the frame seems to be tilted somewhat, downwards. I'm rather unsure about this, primarily, I think, because there aren't any very sharp contrasts as yet.

-4.0 Still looks like an indoor scene. There's a man seated over to the right before a desk. He seems to be looking out of a window of some sort, but whether it's window or white painted wall, I don't know. There seem also to be some forms in the lower left quartile. Again, I'm not sure.

#### SUBJECT PI

35-3.0 There seem to be a lot of people standing at the top with their heads hanging down and from windows. It reminds me of a railroad station, perhaps the Pennsylvania station in New York City. I don't know.

#### SUBJECT LI

48-4.0 Looks like a man riding a horse, with trees in the background.

What attributes of the sensory data

might have brought about this interpretative extension is not clear from the data. There were frequent references to accumulating roundness of form which led to the proposal of human figures. Subjects Zo, Pi, Ku, Da, and Mo each presented some instances of this kind. However, their references all occurred on slides whose content eventually presented actual figures in movement postures (i.e., Slides Nos. 18, 30, 34, 38, 39), so that the evidence can hardly be considered adequate for a conclusive statement regarding the cues which lead into the movement factor.

Subject Na, whose protocols in comparison with other subjects were decidedly sparse of content, made her report for Slide No. 48 conspicuous for its fullness of production. Subject Ku was accustomed to a great deal of imaginative construction on every slide, particularly after the objective realities of the time exposures had been exhausted. For both of these observers there seemed to be some direct relationship between the difficulty of form derivation and the amount of supplementary construction, including the movement factor.

One additional point became discernible for its frequency of appearance during analysis of the protocols. Even where the natural content of the slide suggested human figures, there were astonishingly numerous references to these forms, in the earlier OF steps, as dead or inanimate, and often not until the later stages of exposure were the figures conceded to be capable of activity. This would reaffirm, in one more way, the conclusion already reached that human movement represents a high order of development in perception, localized at the level of interpretation and exceedingly independent of the sensory conditions. Before the veiled woman on Slide No. 11 became

animate, with a staring gaze, she had variously been designated as a stone face, a portrait, and a statue; the child on Slide No. 39 had been a figurine, a statue, and a half portrait before she came to life as a pensive little Dutch girl; the figures on Slide No. 52 were cut in stone before they were laughing children; the cat on Slide No. 18 was, over and over again, either dead or asleep before it was dramatized as stalking for prey. Even in instances like Slides Nos. 29(A) and (B) and No. 30, where the early advent of form led to early interpretation, there was some evidence of at least a progression from a painting to an actual scene, or from an art mode to an actual figure.

This is only, to be sure, suggestive data; but the trends are at least so unavoidable that the cues for more detailed investigation are probably given here.

#### FELT MOVEMENT

One curious set of references to movement conveyed the impression that the experience may have been localized within the observer rather than projected into the objective content of the stimulus. Slide No. 47, with its predominance of concentric lines and absence of figure-ground articulation, incited at least four observers to remark upon the presence of some felt movement.

#### SUBJECT WO

47-2.0 Well, there—there—there seem to be these—oh, like centrifugal line. You get the feeling of that kind of force, because there's a heavy, dark shadow in the center, and then there seem to be more shadows on—concentric circles around the outside of that.

#### SUBJECT LI

47-2.5 Now it makes me dizzy. It's like looking down through a whirlpool and feel it twisting.

-3.0 That's awful! It makes you sick. It's as though you're looking down in a well. That sort—I don't know. But, anyway, there's an awful twisting motion there which makes one feel uncomfortable.

#### SUBJECT MO

47-0.0 Now this is a band—not a band of light, but a circular kind of picture of—well, a light. The center part of the light is dark, very dark; and the way the lights and shadows are, it looks as if we're looking at a whirlpool, the center portion, of course, being the center or vortex, and the outer portion being—well, there seems to be motion—something in circles, spirals, like a lot of water, or even smoke, or even what the inside of a cyclone would be. That's all.

-1.0 I still get this same feeling of—as if I were looking at a picture of the spiral nebulae—spiral nebulae up in the sky, one of these astronomer's photographs. That's all it gives me—a picture of—of something spiral, and you get the feeling that it's moving, and still it's static, static in the sense that, as you do take a picture of one of the nebula and you can see it—well, it looks as if there's some spiral motion, but really isn't moving. You can't see it moving. That's all it reminds me of. The center portion is dark.

-2.0 Still that same feeling of roundness—roundness. Everything seems to be framed.—

#### SUBJECT ZO

47-3.0—It still looks about the same as it was, but it's becoming—it looks almost like a whirlpool or a—well, a pinwheel.—

Subject Mo reported a similar experience of movement on another slide:

10-2.0 That to me seems to be underwater. I get the impression that I'm looking under the water. Murky. Seems to be swirling. I don't know. I get the impression that it's an underwater scene. Nothing. Indistinct. Everything rather blurred. Shadows—shadows, instead of being sharp cleavages in the . . . shadows.—

-3.5 Again I get the feeling of opaqueness, as if I am looking or *am* in a fluid, such as glass—a plastic fluid, be it water, glass, or something else. There seems to be a lot of reflection of light—refraction and that sort of thing. Sort of—well, a photographer calls

them "ghosts". I don't know. It doesn't seem to be anything definite yet.

Still other excerpts give evidence of a variety of sources from which movement experiences arose.

#### SUBJECT MO

12-3.5 This time it looked to me as if there were—was a picture taken of something moving very fast. The thing that was moving very fast was a big, automatic press—printing press; and the newspapers are going along in one line along the left of the picture, from the background toward the foreground, and passing us by—or passing the camera by on the left. Newspapers are going by very fast. The camera doesn't catch the headlines on them, as there just seems to be this white blur of the newspapers coming towards you. And, of course, the middle of the picture—it's still in shadow. The newspapers themselves reflect so much light, by contrast the rest of the picture seems to be dark. I suppose it's the grey, probably the floor.

#### SUBJECT GA

6-4.5a—The surrounding area looked rather threatening in the way of sort of weather conditions if—sort of like it was blowing up a storm.

-4.5b This still has a very turbulent aspect to the whole picture. Apparently could be water in the picture, stirring around.—

#### SUBJECT LI

1-0.0 A big blur of white with a dark center, similar to the spiral—plateau spiral, in that there is some—apparently a movement.

#### SUBJECT DA

49-3.5 This time I got a feeling of not the clearness in that—in this center. It seemed sort of befogged over, and not just confused as far as, you know, focus is concerned, but that there really is a cloudiness there. Maybe I'm getting battle smoke mixed up into it. Also, perhaps because of this smoke, because perhaps it's dust, there seems to be an object going through here, but I'm not sure. I get the impression of a lot of exci—not excitement, but—well, tumult. That's sort of the impression.



Here again is only an indication of a potential question for further analysis, although the occurrence of these movement references is quite plainly distinguishable from those involving human forms. In all of the instances cited just now, the framing context was of a very low order in the pre- and early transitional stages; the cues were singularly smoothed and regular; and the associated material showed nowhere near any significant advancement in development. If we are justified in hypothesizing from this observation, we could suspect that these natural movement forms are primitive and subjective experiences unlike the more mature human movements which have been objectified and modified by constructive application.

#### COLOR

A number of colored slides were included in the series with the express expectation that some qualitative differences between these and the black-and-white prints might evolve in the course of the study. Some data did accumulate, although their primary value may consist largely in the directions they point up for further analysis.

Subject Mo, who has already been mentioned for his willingness to risk early form trials, missed color entirely on Slides Nos. 15, 31, and 35 until the time exposures. On Slide No. 8 he acknowledged it late in the sequence by reporting:

8-4.0—It's the first time I saw color with this picture. I was quite surprised to see it, because there didn't seem to be any color apparent in the other focuses—foci of the tower. . . .

His performance on Slide No. 31 was remarkably astute throughout; and it is to be wondered whether color, without

being admitted verbally or consciously, yet influenced such successive identifications as "setting sun," "evening picture," "peaceful," "symphonic piece," "misty looking."

Subject Ya exhibited extreme control over the color admissions by adapting them at once to the forms he was utilizing. On Slide No. 35, where he did not get the color until the time exposure, and on Slide No. 31, where he did not admit it until 4.5a, he emphasized, possibly as rationalization in both cases, the delicacy of the coloring used.

Subject Ci, more than any other observer, had persistent difficulty in identifying the colored slides, and on two occasions, when the time exposures revealed the hues he had missed, he insisted that the preceding flashes could only have been in black and white:

8—time At first seeing this I was amazed. I didn't recall it before. In fact, I suspect that only this last still picture is tinted, and that the others were black and white.—

There were other observers, including Subjects Li, Pi, Zo, Fu, Ga, Ta, Hi, Wo, and Jo, who very often arrived at color quite early in OF, certainly long before form was set. On Slide No. v9, Subject Li reported colors where none actually existed, and some of the subjects just listed obviously used the color as a cue to form, such as, for example, the conversion of the autumn leaves on Slide No. 8 to springtime green in the reports.

Subject Re, whose facility with color was never very keen, located the tone effects unusually early on Slide No. 51 and then showed exceptional retardation in deriving the central form, which did not appear until 4.5a. Whether the color admission impeded the acquisition of the form it is not possible at this point to state, but the color is obviously as much

sensory material as are lights and shades, and it might be suspected that its inclusion in any of the early stages would signify that the sensory stage had not yet been evacuated.<sup>44</sup>

#### DIRECTION OF SURFACE IRREGULARITIES

It was only after the end of the study, at a group meeting of twelve of the subjects, that it was discovered that not all observers had perceived the direction of the textural irregularities on Slide No. 33 in the same way. Approximately half of the observers present had seen craters in the upright position, while the remainder had seen blister effects. When the slide was inverted, each group consistently reversed its report for the direction now assumed. In view of the use of shadowed material by the empiricists for the demonstration of the influence of experience in interpretations, and the countering Gestalt defense of the objective controls within the stimulus, this discrepancy seems possibly significant.

#### REINSTATEMENT OF EXPERIENCE

Every case of interpretation has been hypothecated so far as the fitting of developing percepts to some type of pre-established standards. In the repetition of previously used slides and the addition of near-duplicates of others, it was assumed that some experimental control had been achieved over previous experience as one form of these pre-established standards. This supposition, quite naturally, cannot be accepted without the qualifying understanding that the (A) slide of an (A) and (B) series did not con-

stitute the total experiences that went into an interpretation of the (B) slide, and that inversions and reversals of exposure on the (B) member introduced additional conditions to be accounted for outside the (A) original.

In spite of the number of occasions where memory content was stimulated, the data give no clear-cut evidence of a trend in perception favorable to specific memory influences. Nonetheless, some repetitive types of excerpts suggest that there are influences of a prior sort at work in some fashion. Comments, for instance, on the familiarity of forms have already been noticed in earlier quotations, and they appear again and again in others of the protocols. These are feeling states, originally, and often highly exploratory in the manner in which they are offered.

#### SUBJECT MO

8-3.5 Well, this is the largest space. It has your brightness over toward the upper left, and in this scene very nebulous-looking dark shadows. On the whole, it seems to me to be a picture of stalagmites and stalagmites of a very white, crystalline color, in a cave, maybe; but there's a definite form of familiarity. I can't say. That's about all.

#### SUBJECT FU

18-3.5 This time I had the feeling that it was a picture of an animal or something. The part on the left looked something like the head, as though the animal were facing you, and then the back part was dark for the rest of the body. It sort of gave me the idea of the picture that we had the other day of the cat sort of crouched on the ground. I had the feeling that it was sort of a similar picture, and this time I can see the dark and the light seem to be forming more of a picture. Could be more coherent than it's been before.

40-1.0 -For some reason it reminds me of a graph that I saw yesterday where there were light bulbs on the graph to represent pictorially the different sizes of electricity or

<sup>44</sup>Smith (97, 346) reported that when he employed his shortest exposure speed (approximately 1/130 sec.), colors tended to disappear altogether with the majority of subjects. It is a not infrequent occurrence with rapid tachistoscopic exposures that color is much delayed in being named, if at all.

something like that. And so, for this reason I think there's—what makes me see two little eyes in the—this round place, too, probably that there's dark in this egg-shaped affair, and because of what I saw yesterday it reminds me of it.

#### SUBJECT DA

42-4.5a Again a very definite impression of—of sensing something, yet I don't know what is! Perhaps it's this: that this foreground we see—this white which is diagonal, is a boat, and the background with these little white puffs in it is water below, and the white puffs are foam or the crest of the waves. Perhaps I'm confusing this slide with another slide which I saw once before where a woman was being towed along in a row-boat. Whatever it is, I—I did have just a fleeting idea that I knew what it was, but I can't tell.

Perhaps it is significant that the feelings of acquaintance were often poorly placed. There is no dearth of illustrations for this tendency, particularly when the reported forms are checked against the actual content of the slides.

#### SUBJECT CI

23(B)-3.0 I wonder if that could be the same picture that I saw yesterday, with the grillwork and the reflection. I've been wondering about the past two exposures, trying to get some clue to substantiate that suspicion, and have not tried to voice it, although I'm really guessing at it.

#### SUBJECT RE

36-(A)-2.5 Looks like an indoor scene, something like one picture I've seen before, but I just can't recall it.—

-3.0 Can't make out any form quality, but it reminds me of a picture seen before of the close-up of a camera. I don't think this is it, though.—

#### SUBJECT TA

v37(B)-3.5 Oh, I remember that, I think. I see a safety pin, I believe—an open pin in the center. I believe this is the slide that was used early in the experiment. It's a jackknife and a safety pin and a button and, oh, a penny.

-4.0 No change.

#### SUBJECT HI

42-3.5 This may be the shot I've seen before of the sand the—along the shoreline with the water. I believe I had the same impression from that same slide as I do this one.—

Slide No. 27(A) was run after Slide No. 22 for the special purpose of checking the recognition of the same building in two different settings; but so few subjects reported any similarity at all that no conclusion could be reached, other than a conviction on the evident complexity for perception when contextual relationships are altered. Subject Zo, at the end of time exposure on Slide No. 32, inquired if this were not the same scene as Slide No. 9, taken from another angle.

Some of the illustrations are convincing that occasionally no recognition occurred at all. Subject Jo made no mention of duplication on several repeated pairs, nor did she report any differences between Slides Nos. 29(A) and (B). Subject Fu likewise thought that the difference between (A) and (B) of Slide No. 29 was a matter only of clearer focus. Slide No. 14 was difficult for many subjects in both upright and inverted positions, and a number did not identify them as the same at all. Subject Da, who had seen Slide No. 14 even before the study began and then again in the experimental series, did not recognize it in inverted position until time exposure and related that absolutely no carry-over had taken place at all.<sup>45</sup> Subject Da, even in identifying Slide No. 29(B) as a duplicate of

<sup>45</sup> This experience is contrary to that reported by Bartlett (2, 239): "Obviously, further experiments ought to be made to determine the readiness with which other changes are noticed. Never once, in any of these cases, did a subject fail to note, when a diagram was turned round or put upside down, that it was the same figure in another position."



the (A) member, revealed some confusion in adjusting the earlier experience to the present situation:

29(B)—time This is interesting, because I can see how I used that last slide [No. (29A)] to influence my seeing this slide, that is, I was quite sure that this man in the left-hand side, and I was seeing his entire silhouette and not that the legs were out of sight. And—I saw the ripples of material, as I called it, extending much more over to the left border of the picture than they really are. When I first saw a table several exposures back, this seemed to be much more in the distance, though I realized later it was nearer to this than it is now. I didn't see this husk of corn in the immediate foreground but was rather noticing these husks and didn't see the facial features clearly. And I am surprised at the blank wall in the background instead of the other background which is a field in the other slide.

Fortunately, not all of the memories fared so inaccurately. There was no subject who failed to give accurate recognition of Slide No. 18 before time exposure, when it was repeated in the OF-IF series. And Subject Da, in commenting on the recognition, estimated that it would have required at least one more focal step for naming the content had she not recalled the slide from the previous session. The success of Subject Zo in completing the struggle for recognition of differences in Slides No. 29(A) and (B) has already been cited in another connection. On Slides Nos. 36(A) and (B), where the background remained essentially the same but the foreground figures were altered, there was more attention to the figures than to the background; yet, strangely enough, this very fact seemed in several cases to lead, because of the slight inconsistencies, to the probability that (B) was a duplicate of (A), and the background was then checked for confirmation.

If some memory influence could be

accepted, the question still would have to be asked what clues facilitate recognition when it does occur. None of the excerpts reveals more than possibilities, but there are some indications that, whatever the factor that brings about the matching of stimulus and pre-established pattern, once successful, it forecloses with great speed. Slide No. 2 had been made from an original in the private collection of Subject Mo, and recognition for him, once tentatively tried, was immediately accepted:

2-2.0 . . . I can't figure out what it is in the center . . . spread out. Looks to me like something like striated muscles. I don't know!

-3.0 I know this. This is the picture I gave you! I can see the whole thing now. I can see the pilings. . . .

Subject Ya exhibited similar behavior on another slide:

35-4.5a No, this is a picture of a pond with a—with a—wait a minute! This is a picture of Mirror Lake taken from near Pomerene Hall, with the cement work around the Wishing Well showing in the right-hand background and the hillside rising back from it in the far background.

-4.5b Nothing to add, except I'm not so sure it's Mirror Lake, now.

-time And it 'tis, though! This is a—the picture which I described two exposures ago. . . . I don't recall, in my memory of Mirror Lake, however, a tree leaning at a 45° angle out over the lake.

Other cases of duplicate stimulation, in which the memory was reinstated more slowly, hint strongly that only detailed partials of the original pattern are necessary to reinstate the first whole, accounting thereby not only for memory functions but for many inaccuracies in reporting the current perception. Memory, too, on this basis, would have to be conceded as susceptible to constructive alterations.

## SUBJECT YA

29(B)—time This is the second exposure of this picture, that is, it appeared—no (long pause). Wait a minute! This is not—is not—this is the second exposure of this picture, I believe, or—it is a drawing. It's a picture—the picture involved is the figure—I seem to feel that there—that this is not quite the same picture that I have seen before but it—but is pretty much the same. I don't recall that in the earlier picture the woman was working at a table. It seemed to me she was working, not at a table, but without any work surface there in front of her. And as I recall the previous exposure, there was more snow on the man's clothing which is not—now no longer apparent. That's all.

45(B)—time This is the same barn [as on Slide No. 45(A)], though I can't quite—I know it's the same barn because of the position of the silo, the open door into what I thought was a tool shed but which now is quite apparently a garage for probably a tractor. The built-up L-portion for the stables with the corner supported by posts is—precisely the same. The position of the silo and the shade tree is exactly the same, and the corral is present in the enclosure to all and again of the barn, and a rail fence with the same kind of angled top gate that was present in the other picture. This is taken of a different season of the year—or at least the artist sees it differently. It's a drawing, again, because there's vegetation shown on either side of the road which did not appear in the previous sketch. This is really very curious, because, as I recall it, the garage sort of affair was on the left-hand side of the picture, the extension of the barn making the stables was on the right-hand side, and I can't—and yet the silo was

in precisely the same position, so perhaps I have to give—and yet the vegetation is the same: the plant—the shrub in the foreground, the tree in the background in approximately the same position. I have to figure out that angle business! Well, I guess I'm simply unable to state whether this is the same barn or another one that's so similar, but the two can scarcely be distinguished. At any rate, there's a very clear reversal of the relative positions of the garage and tool shed and the extension which made the barn—the stables for—or stalls for horses or cows. And that's all.

Subject Mo had supplied the original for Slide No. 30 from his private collection and hence was thoroughly familiar with it in advance. Once again here is illustrated the potency of parts to re-instate an entire original:

30—2.5 I suspect that's my picture.

—3.0 It looks like my picture, yet I don't think it is, because the figure seems to be straightened up. The legs are extended and raised, extended and long, rather than squat, and he seems to be taller than the picture I gave you. . . .

—3.5 That is my picture. That definitely is my picture. I can see it plainly, now. Not only from what I saw on the screen, but what's helping me is my introspection and retrospection, memory, imagination. The rest I'm putting together. I know it's my picture. Just some details suggest it, and I know it is. I see the rock in his hand, and the arm extends backwards, and his profile.

—4.0 Yeah, that's—that's it, all right, although when you—in the out-of-focus things, it seems much smaller than it really is.

## CHAPTER VII

### INTERPRETATION AND APPLICATIONS

THE analyses of the preceding chapters have lent support to the direction of perceptual thinking. They have verified that perception is a developmental process in time, and that the quality of the progression is an orderly sequence. They have shown that the perceptual gradation differs in no basic respect from any systematic physical or psychological process and hence is congenial to the same methods of examination and deduction. They have emphasized how subordinate is the initiating sensory role, how fraught with difficulties is the transforming level, and how extravagant may be the culminating act. Withal, they have implied that the dynamic, kaleidoscopic pattern of perceptual construction may hold the key to long hoped-for applications in psychology.

#### IMPLICATIONS FOR PERCEPTUAL THEORY

Into what type of framework can such a moving process be fitted?

Only a theory which is predominantly motor in rationale could accommodate a concept of perception so much at the mercy of the activity of the perceiver. Sensory materials, to be sure, are recognized as initiating and instigating stimulus patterns, but their potency is lost almost as soon as their function is described. This, it is inevitable, is foretold in the very nature of their role: their composition derives from energy aggregations; their characteristic act is an impingement of force; and, most important of all, their operation carries a threat of potential destruction for the organism. There is little surprise, then, to find even at the sensory level that the organism retaliates with preliminary transforma-

tions and modifications. Renshaw (79, No. 1, 3) points out that structural features of the visual receptors force the first of the phenomenal adaptations:

Nothing that we can find from our knowledge of the structure of the retina, the optic bundle or the nature of the conduction of impulses in nerve, can possibly give us the answer. And if in the light of everything that we know about rods and cones, about the nature of nerve conduction, etc., is taken into consideration and we try to answer the question: What is the physical mechanism which enables us to discriminate small differences in the intensity of illumination? We are forced to conclude that no satisfactory answer to this question can be found.

Single fibers in the optic bundle bear the responsibility for nerve conductions from some 4,000 sensitive cells in the retina; cross and longitudinal interactions within the optic bundle set up distorting connections; and the energy densities of the stimulus itself exclude steady reaction in the receptor organ:

If you casually mention the facts, shown by recent research, that in uniform illumination as a pattern of light falls upon the retinae some of the photosensitive cells only fire upon the cessation of or sufficient reduction in the intensity of the light. Others fire, first in a burst and then settle to a slower frequency, throughout the duration of the excitation. This latter type must give us the basis of all differences of photometric intensities and therefore play a primary role in the resolving power of the eye, form discrimination, etc. Only 20% of the photosensitive cells are discharging during continuous stimulation, and the frequency of the afferent volleys of ions vary with changes in intensity of illumination from about 5 to 150 to 200 per second in the human. Add to this the fact that the retinae themselves are a region of transformation, so that it is impossible to regard the thing seen out there



as a direct projection of the light pattern (79, No. 2, 2).

Dewey (12, 358) was right, therefore, when he protested that stimulus and response are teleological distinctions of function and not of existence, for the sensory impressions have no consequences of their own apart from the transforming forces to which they become subject. Judd (49, 202-3) says of this relationship:

[In] this substitution of the formula of coordination for the usual concept of succession . . . we shall speak rather of a certain state of preparation which is at once a state of sensory content and motor strain; and we shall point out that this complete, inseparable state is transformed in a fashion determined first by its own character and secondly by the external stimulus, into a new modification of experience,—this new modification being at once a new balance of content and strain.

This interdependency the inflated transitional level of our own data leaves profoundly indisputable.

On the authority of Koffka (54, 562), any good psychological description must be founded in functional facts. It cannot be emphasized too strongly that the motor phases of perception are functional for the organism. As Köhler (18, 65) so aptly notes, a steady state is the natural existence of an organism, although it may not be possible of fulfillment in the complex of some conditions. "This does not alter the fact, however, that the organism is constantly on the way towards a steady state under any given set of conditions." Such an organism, always addicted to seek a state of equilibrium with its environment, could do no less than it does. Disrupting impacts of stimulation must necessarily force compensatory adjustments from it. The corollary would eventually follow, therefore, that the fating is done before

the stimulus occurs. Because the sensory is fundamentally exciting, and the motor opposedly stabilizing, relationships between the two will constantly be antagonistic; and motor reactions to sensory cues will tend to level out differences which imperil the maintenance of an equilibrium status (82, 19). If it is required, what is physically present may be both supplemented in the perceiving process and partially suppressed (79, No. 1, 2). In any event, according to Judd (49, 224-5), adaptability of the sensory to motor manipulation is the only assurance for sensory representation in the perceptual act:

The discussions of this paper supply I believe the desired definition of the nature and conditions of space percepts. Space is a form of arrangement which is conditioned by the motor possibilities of the nervous system. Whatever sensory impulses can be brought into coordination and equilibrium by a single act will be grouped in space (and time) together. Whatever sensory impulses can be responded to by a succession of acts will be grouped apart.

In this sense, no stimulus sets in motion its own acts but those already determined for it.<sup>46</sup> It is the only way it may avoid violating the basic pattern of organic life.

<sup>46</sup> It is interesting to note that Hughlings-Jackson (46, 328), almost at the threshold of the dedication of psychology to science, was promulgating in British medicine thinking prophetic of these current viewpoints: "It seems clear enough that the process which ends in ideation or perception is dual. . . . When we say we see a brick, all we mean is that we project into the environment, ideal or actual, the image which that brick has roused in us. This image arisen in us is the survival of the fittest image at the termination of a struggle which the presented brick has roused in us, is the end of the subjective stage; the further stage . . . is the objective—it is referring the image already roused in us to the environment, actual or ideal. The brick is for us nothing more than what it has itself roused in us, so that . . . we should, I think, use the . . . figure, that an external object acts on us and develops in us such as we are, *what it can . . .*"

The act [of perceiving] is one which maintains or restores equilibrium. It puts the organism in command of a more favorable position in relation to his surroundings. It enables him to identify, classify, name or adopt an attitude which is preparatory, prodromal and as such shows us part of the mechanism for the long section unity and continuity of experience. Unity and continuity of the perceptual process is its most general feature (82, 5).

Perception thus must be regarded as a primary phase or episode in the continuous stream of adjustory movements. Its main function is to set the organism to responding in ways which are for him biologically and psychologically expedient. There is no essential categorical difference, therefore, between perception and learning except perhaps that learning runs a longer course in time. In either case, the essence of the whole series of events comprising a perceptual or learned act lies in its motor character. The sensory or impression aspect is, in itself, a form of energy impact tending always to be more and more closely linked in time with the consummatory movements (82, 13).

Now, the essence of such theoretical framework is adjustment, and adjustment is technically motor. Indeed, not one determining static element can be found in it. Ribot (87, 41), long before sensationism was brought to its knees, had already said: "Pour ma part, je viens d'essayer de montrer que l'activité motrice pénètre et enveloppe notre vie psychique et en est la portion solide." With so current a writer as Gesell (27, ix), there is still the same acknowledgment:

But is [the mind] ever less than movement? Is any psychic state ever so attenuated that it is devoid of some bodily tension, some active motor content, or motor derivation? Is not all thinking dependent on motor set and postural adjustment and readjustment?

Movement, to be sure, is never an end in itself; yet the state of equilibrium to which it is consigned in perception it can only approximate without complet-

ing.<sup>47</sup> Hence dynamic trends in perception strive toward a concept of stability which has no other locus outside phenomenal existence than measures of the movements which propel the organism toward it. Buttressed by this fundamental understanding, we propose to have established, by our data, that the concept of meaning, about which Bartlett so earnestly inquired, is dependent upon the adjustory movements of perception.

With what facts do we cushion our stand? With demonstrations abundant in the present study that the sequence of perception is a design for exploration and that the consummation of that exploratory phase is completed when meaning is found. At the point at which trial movements have attained a serviceable condition for the organism, there meaning has its threshold. It is couched in movement sequels, and the organism, by the act of interpretation, manifests its inauguration.

This categorical assignment may not be expected to go uncontested. Some of the viewpoints which have preceded it are essentially irreconcilable with it. Wever (111, 220, footnote), although he looks to future inquiry to enlighten the whole theoretical basis of perceptual meaning, takes the position of a much earlier derivation:

It is very obvious in these experiments that the most primitive experience has a real meaning, though it is not necessarily referred to some familiar object outside its setting. The simplest figure-ground has truly a significance to the subject. Upon more extended observation the perception undergoes change. When this change is such as to produce a report, a naming, as of some familiar object

<sup>47</sup> Paradoxically, all psychological goals, were they actually ever terminated, would annihilate the organic existence which they are established to benefit.

—an object meaning may be said to be present.

Parsons (73, 26) prefers the view that "The cognitive element of the emergent percept is meaning, and as evolution progresses percepts become more complex and meaning grows." In Parson's analysis, meaning is rooted in an instinctive mental process with emotional qualities.

Bartlett (2, 261) quotes Ewald as citing that the lack of meaning could never be more than the relatively meaningless. Bartlett (2, 262) himself, at one point, refers to both vague and definite meanings:

Apart then from the attribution of meaning there is no perceiving, but meaning may be attributed either in a very vague or in a very definite manner. In the former case there is a tendency to speak of the experience as a "feeling" of something. What the attribution of meaning is at its minimum the experiments throw no light upon, but they do illustrate how, when meaning is vaguely attributed, there is a tendency to speak of it as a feeling. . . .

This "feeling" however is not feeling proper, though it is accompanied by that, but it is really vague apprehension, either in the first place of some *thing* or in the second place, when analysis begins, of certain relations. By development of the first we get all the marks of imaging, and of the second all the marks of thinking.

Sometime later (2, 265-6), in what amounts to some retraction of this stand, he speaks of the many different conditions and forms in which the effort after meaning is found, implying that the "apprehensions" and "feelings of relations" which he earlier introduced might be no more than conditions in certain phases of the search.

Gestaltists, while fully congenial to a concept of meaning,<sup>48</sup> have sometimes

added more to the confusion than to clarification of the vital issues. Vernon (99, 93) certifies that they have differed, first of all, on the genesis of the meaning reference:

If we compare these stages with those described . . . in connection with the development of perception, we see that here far more stress is laid upon the emergence of the structural qualities of the percept, and less upon the meaning and classification according to previous experience. This marks the essential difference between the observations of the Gestalt psychologists and their observers, and those of other psychologists, particularly of some of the American groups. The former would say that the apprehension of meaning is something which we have superimposed upon the primary quality of form; the latter, that an appreciation of formal qualities is impossible without the emergence of some meaningful relationship based upon past experience.

Köhler's (18, 390, 392) efforts to refute Rignano's stand for emotional significance leave somewhat doubtful whether Vernon's characterization of an "overlay" is as consistently the Gestalt position as is a more basic inherency within the stimulating situation:

Gestalt theory holds that though past experience does often influence present experience-structures . . . "autochtonic" sensory organization precedes, and indeed *must* precede this influence. . . . [Rignano] fails to

torian was right when he insisted that no laws of sensation, association or feeling—pleasure and displeasure—could explain a decision like that of Caesar's to cross the Rubicon. . . . A psychology which has no place for the concepts of meaning and value cannot be a complete psychology." Again: "The positivistic interpretation of the world and our knowledge of it is but *one* possibility; there is another one. . . . Meaning, significance, value, as data of our total experience give us a hint that the latter has at least as good a chance of being the true one as the former. And that means: far from being compelled to banish concepts like meaning and value from psychology and science in general, we must use these concepts for a full understanding of the mind and the world, which is at the same time a full explanation."

<sup>48</sup> Koffka (53, 19, 21) declares: "Thus the his-



see that his theory of the *exclusively* effective nature of organization is unfounded in fact. Preceding the emotion one might have regarding a perceived object, that object itself must be experienced. The constellation of stars which we call the Dipper may remind one, say, of a "wagon," but this can occur only *after* one has experienced some organized form which then and *as such* is seen to resemble a wagon.

If I can survey the structure of an entire situation and my behaviour therein yields a "solution" relevant to the intrinsic property of that situation as a whole, my behaviour is "meaningful." On the other hand in clear cases of organization the whole-process is determined by intrinsic properties of a whole situation and therefore meaningful behaviour may be considered as a case of organization. . . . For the meaningfulness of either process, consciousness is only of secondary importance. It is just as intrinsic to visual structures that they should strive towards their own definite closure as it is for a human being that his behaviour should proceed towards the intrinsically appropriate end of a behaviour sequence. If the circumstances of a visual perception permit such a closure, the presented object is said to be a "*sinnvolle*" figure, organization, design, etc.

One would expect any Gestalt explanation of meaning to be bound up eventually with part-whole relationships and impulsion toward completion, as, indeed, Wertheimer (18, 16) makes it:

Of fundamental importance is the difference between processes whose factors are externality and adventitiousness and those exemplifying genuine meaningfulness. The processes of whole-phenomena are not blind, arbitrary, and devoid of meaning—as this term is understood in everyday life. To comprehend an inner coherence is meaningful; it is meaningful to sense an inner necessity. A prediction may be meaningful in this sense as may also a completion of something incomplete; behaviour is meaningful or not, and so on. In all such cases meaningfulness obtains when the happening is determined not by blindly external factors but by concrete "inner stipulation." Hence we may say in general that a whole is meaningful when concrete mutual dependency obtains among

its parts. The mosaic or associationistic hypothesis is therefore on principle unable to supply *any* direct approach to the problem of meaning. Whether there is such a thing as meaningfulness or not is simply a question of fact.

In such a scheme, as Parsons (73, 50) points out in another connection, the function of pattern may be the arousal of meaning from even incomplete data.

Most of these efforts to deal with meaning have shared the common criticism that they failed to supply any criterion against which their judgments might be measured; and no small fraction of this objection has accrued because they have persisted in trying to specify a non-specific concept whose only evidences are its operational records. Vernon (99, 9-10) takes account of that fact in appraising some of Bartlett's data, when he speaks of the conative drive toward completion by the attribution of meaning:

Even for the child and the unsophisticated adult the understanding of meaning is in itself a process of enormous complexity and extreme difficulty of analysis. Such an analysis is at present impossible by the methods of experimental psychology. . . . [The] meaning, when fully understood, includes a knowledge of how to deal with this particular perceptual situation. . . . Hence we are justified in making our original statement, that the perceptual process when complete includes some form of response tendency.

We believe we have surmounted Vernon's reckoning that the task is greater than the methods at hand. We have forfeited *adjustment* for the *process of adjusting*; and in that fortunate revision of technique, we have been able to observe when and how meaning arises by relying upon the organism itself to supply the operational evidence from its own performance.<sup>40</sup> In the service of this func-

<sup>40</sup> Vygotski (101, 432) employs a picturesque

tional criterion, motor theory supplies theoretical framework which the prior discussions of meaning have not yet exhibited.

How, then, is meaning inherent in motion action? We have already shown that the moment of excitation inaugurates a series of adjustory steps. The physical intensities at the retinae set up impulses in the sensory fibers; the sensory impulses are conducted to the brain and out to the response organs; proprioceptive impulses from the contractile and secretory acts are translated back to the brain (79, No. 1, 1). In the returning backstroke the organs of response prescribe approximations and corrections; and the further modifications at the cortical level set for the organism its limits of adherence to the instigating impression. The tentative, exploratory acts<sup>50</sup> which we watch in the perceptual sequence are the explicit reflections of their parallel motor developments, and they anticipate the final order of imposition baptized with the blessing of meaning at the termination of the struggle. With the case of word meaning for illus-

tration, Rowland (91, 5) dramatizes the consummation of meaning in this closure of the backstroke circuit:

There need be no actual felt tendency to reproduce, indeed no strain or sensation of any kind. But the very sensory stimulus of the sound must have some motor discharge before it can become a conscious state. The combined discharge of the associated auditory or written images which may be with it . . . gives a certain balance or *set*, to consciousness; that balance gives rise to its own peculiar feeling; and that feeling is the skeleton of its so-called meaning. If on receiving the stimulus there was not even a reactive tendency to reproduce the word, the last vestige of its meaning as a word would be gone.

Let Renshaw (84, 24, 40), to whom is due the debt for recognition of important motor applications, summarize the character of the motor viewpoint:

. . . [Motor theory] regards with favor most of the basic claims of Gestalt or configuration theory but insists that it must go at least one important step farther. It holds that all sensory and central or cortical processes are really preliminaries to the important consummatory effector processes; that mental life is movement, the backstroke from which is the principal means of the revision of function, by approximation and correction called learning.

This is not mentioned by Wertheimer. It is emphasized strongly and logically from the fact that even though the physical pattern which reflects light to the sense organ and is thence transformed into a pattern of relatively slow moving volleys of ions in the conductors and eventually sets up a pattern of electronic structure in the brain, yet may be radically transformed by the effector pattern of the terminal action, the backstroke from which becomes the residual ground which gives meaning to the entire process. This is the view of motor theory.

We have one further step yet to be made. As Bartlett so beautifully states in an earlier quotation, the needs of the organism demand freedom from the

figure of speech for this use of operational measures: "When we connect the complicated internal activity with the external one, making the child choose and spread cards for the purpose of memorizing, and move about and distribute pieces, etc., for the purpose of creating concepts, we thereby create an objective series of reactions, functionally connected with the internal activity and serving as a starting point for objective investigation. In so doing we are acting in the same way as, for instance, one who wanted to investigate the path which the fish follows in the depths from the point where it sinks into water until it comes up again to the surface. We envelop the fish with a string loop and try to reconstruct the curve of its path by watching the movement of that end of the string which we hold in our hands. In our experiments we shall at all times also hold the outer thread of the internal process in our hands."

<sup>50</sup>For Bartlett, they are expressed in feelings, images, and thought processes; for the present study, in the struggles against the sensory data in which figure trial forms; textures, diffusions, perspectives, and evidences of various frustrations.

present, and somehow, via the schemata, they achieve an adventitious reshuffle in which chronology is exchanged for qualitative satisfactions. The exploratory, anticipatory motor impulses of the present, flexing to the adjustory needs of the moment, meet and blend with the evidences of previous adjustory movements, which, too, have followed through to better orders of stability. The product of this integrative process insures both that the present can never be completely free from the past nor can it completely conform to it.

No simple new movement can ever be made. . . . Just as all the creations of imagination are only new combinations of old elements, so all the complicated movements we acquire in a lifetime—the skill of a mechanician, the fingering of a violinist—are new combinations of simple movements we were born to perform. . . . The formation of new combinations, then, of movements that are themselves given to us by our inborn constitution, is what we have to study (104, 5-6).

Perhaps we have found here in motor patterns the answer which Bartlett wishes for when he asks how the schemata break up the natural order of events to promote the benefit of the organism.

Renshaw (84, 27) posits great significance from a determination of such motor patterns:

If it could be shown that the precesses of field structuring are nothing different from other known processes in nature where forces interact and approach a more stable equilibrium, such demonstration would mark a forward step in theory, the consequences of which can hardly be overestimated. It would at once place the perceiving of forms and executant manipulatory acts in one and the same category.

We claim that our data have shown this for perception, by the aid of motor theory.

#### IMPLICATIONS FOR CLINICAL PRACTICE

There is no presumption that the trends of the present study formulate a new type of clinical therapy. The original statement of the problem was content to question gravely the validity of the theory of non-directive treatment, and in keeping with that aim there is still no disposition to exceed a discussion of frames of reference. Theory, however, is only worthy of the name when it functions in behalf of the eventual applications, and that function, in a science, is universally the ordering and systematization of the facts which account for the assorted applications of the discipline.

There can be little dispute that clinical goals in psychology have been grossly misplaced. We have been looking to the stars and talking about adjustments for clients as some psychologists have looked at sensory stimuli and expected to read therein the perceptions and meanings to which they would give rise. But adjustment, like meaning, is a concept of phenomenal character, and we know only of its nature what is operationally revealed to us in watching its emergence. The clinician's goals, we are inevitably forced to face, are never resident in *adjustments* but in *motor processes of adjusting*. A frank cognizance of the dynamics of psychological life makes that fact manifest without the assistance of the current investigation. What the present study claims to contribute to that fact is some knowledge of the tremendous volume and import of the struggles of the organism to evolve a semblance of equilibrium with its environment, and, in addition, to point up the correlative fact that the secret of our efforts to bring success in the struggle lies, without a question, in the interval of the struggle itself.



One interesting conclusion in the present study to the use of the tachistoscopic procedure is the fact that the short exposures do not necessarily prevent seeing, but that perception at any speed is contingent upon certain intermediate steps in sensory-cerebro-motor organization. The phenomena which emerge from the organizational sequence are qualitatively distinct from the sensory components out of which they arise. If the quality of that emergence is in any sense to be assured, the field structuring which arranges it must in truth be ordered, and on that ground we can no longer defend the therapist who stands by "with an understanding attitude" while the client probes the direction in which the emergence shall occur.

In a highly informative series of studies reported out of the Russian Psychological Laboratories of the Medico-Biological Institute and the Akademii Kammunistich-eskogo Vospitaniya, Luria and companion workers (63, 65, 66, 101) have explored the question of the development of mental functions in the child, particularly with reference to the influences of the cultural order. One of the notable results of these studies has been the distinction between the mental functions which evolve under natural growth conditions and those which develop under the influence of extraneous impeti. Luria (65, 35; 66, 493, 495, 500-1, 501-2) himself explains the conclusions to which some of the studies have led:

A number of experiments carried out by Soviet psychologists on the initiative of L. S. Vygotski showed that the development of mental functions does not always take the same course and cannot simply be reduced to terms of continuous growth or to concepts of habit formation.

No development—that of the child included—in the conditions of modern civilized

society can be reduced merely to the development of natural inborn processes and the morphological changes conditioned by the same; it includes, moreover, that social change of civilized forms and methods which help the child in adapting himself to the conditions of the surrounding civilized community.

The transition to civilized habits of conduct is thus reduced to the alteration in the main scheme of behavior: instead of applying directly its natural function to the solution of a definite task, the child *puts in between that function and the task a certain auxiliary means*, a certain manner, by the medium of which the child manages to perform the task.

One thing proves really interesting in this series: the experiment proves that the difference between the intellectual operations of a pre-school child and a schoolboy is not of a purely quantitative kind, that the schoolboy is armed differently from a pre-school child in point of quality, that the structure of his processes is essentially different.

The cultural historical development of psychology goes along the path of complication of cultural methods and habits; the history of culture starts with a primitive outward technique and ends with a complicated psychological technique. It inevitably develops in man the functional utilization of his own conduct. It is this latter process of changing one's own attitude to psychological processes functionally used in their qualitative forms which we observe in experimenting.

From Vygotski (101, 418, 421) come similar statements:

The same cases show that cultural development does not create anything over and above that which potentially exists in the natural development in the child's behavior. Culture, generally speaking, does not produce anything new apart from that which is given by nature. But it transforms nature to suit the ends of man.

However that structure does not remain unchanged. That is the most important point of all we know concerning the cultural development of the child. This structure is not an outward, ready-made creation. . . . It cannot be forced on the child from outside, it always originates inwardly, although it is modelled by the deciding influence of exter-

nal problems with which it operates. After the structure comes in to being, it does not remain unchanged, but is subject to a lengthy internal change which shows all the signs of development.

In the very nature of the motor processes which underlie them are contained these qualitative changes of performance. Renshaw (81, 47) illustrates how the backstroke, in its modifying progression, makes possible restructured functioning:

I have pointed out previously that many studies have indicated that the muscles and the glands impose backward upon the central nervous mechanism a certain selectivity which is as important for learning as the qualitative and quantitative sensory components in the pattern. It is not unlikely that we shall be forced to take the point of view that all organic functions are susceptible to reorganization through practice or training even though at present some of them seem to be stable, fixed, and incapable of such adventitious change. The likelihood is that these functions which have thus far resisted our efforts to train them are not functions insusceptible to practice effects, but merely functions which have failed to improve because of our own ineptitude in devising adequate and appropriate training conditions.

Balance in the perceptual field becomes an accomplishment of the motor effects, and any attempt at reorganization of the characteristic structure must naturally fall into motor patterns. That is to say that emphasis is no longer at the moment of stimulation, as, traditionally, the clinical emphasis has been. It is now to be applied in the building of residual motor influences, since "perceptual reorganization is a fundamental recasting of movement, transforming the whole active process of give and take into something radically different" (82, 6). "An act or movement, no matter how simple, that is skillfully done is a different kind of movement from the

'same' movement done by a novice or a beginner who is untrained" (81, 44).

If the non-directive clinician inquires how the movement changes may be effected in therapy, we must reply that that answer is not within the premises of this study. We can point out from our observations that perception is a difficult achievement; we can deduce from our interpretations that the determinants of the final quality are operative at the dynamic phases; we can suspect that the determinants can be retrained only by attacking them in their motor patterns; and we can urge that the clinician be his own experimentalist in devising and actively trying conditions which may bring effective residues of structural reorganization. Above all else, we can insist that the client who is left to his old and individual habits of perceptual performance has no more chance of resolving his problem under the surveillance of a non-directive therapist than he had before he entered the therapy situation. That he sometimes does meet success in attaining a solution in no way attributes the credit for the success to the non-directive technique.

#### IMPLICATIONS FOR THE RORSCHACH METHOD

Certain of the factors of the Rorschach method are paralleled by emergences appearing in the present data. When these latter are inspected in terms of their order of emergence and their functional contribution to the total perceptual act, they prompt interpretations which are remarkably substantiating of the diagnostic applications to which the Rorschach is normally put. This finding suggests the further conclusion that the genesis of the more important of these factors may now be stated.

*Emergent*<sup>51</sup>*Rorschach  
Symbol*<sup>52</sup>*Rorschach Diagnostic  
Value*<sup>52</sup>

- (1) *Sensory data*: Most primitive perceptual level; completion of perceptual development requires discard of this material. Includes descriptions of density (haziness, diffusion), intensity (brightness, darkness, lightness, greyness), location or position, size, direction of tendency, counting. Often accompanied by expressions of tensions and "feeling" states. Only analogies at this level are unformed, unbounded sensory experiences (clouds, smoke, moonlight, sunset, etc.).

Functions appear to be: to stimulate and initiate activity; as cautious reluctance to advance to new level; as contribution for integration at higher level; as conversational material until something further can be found.

FCh, ChF, or Ch: response determined by total impression of the shading and diffusion (haziness, lightness, thickness, weirdness, greyness, vastness).

If FCh: control over central mood reactions (after Binder); anxiety with self-consciousness, awareness of what is going on within oneself; careful attitude to promptings from within, introspection (after Klopfer); attempt to meet environment with caution and insight.

If ChF: domination by central mood reactions (after Binder); chaotic disturbances, depression; some anxiety.

If Ch: abnormality in central emotional life; abnormal sensitivity to unpleasant moods; depressed, irritated, anxious moods; depression or some internal disturbance in the central emotional life (after Binder); "free floating anxiety" (after Klopfer); psychoneurotic anxiety (after Guirdham); deep inner conflicts, turmoils, unrests, non-specific fears.

*Interpretation:*

Normal progress in the perceptual act is away from the sensory data. Any retention of it in the normal act is so molded in the process of integration into the total that it loses its original sensory character and assumes an independent significance. The subject who reports either wholly or partially in terms of sensory material is unable, for some reason, to take the normal progressive steps. When all other conditions are favorable (i.e., focus, illumination, etc.) to the introduction of the advanced levels of perception, adherence to the sensory data must imply that the subject is blocked from such progress. In terms of motor performance, antagonistic movements may perpetuate a state of conflict which cannot be resolved until one or more movement phases are able to take dominance over subordinate phases. In terms of the Rorschach, the assumption of unlocalized anxieties of a conflict nature seems justified, and the severity of the conflict proportional to the measure of primacy of sensory persistence.

<sup>51</sup> The emergents of the present data are discussed as pure factors. Any attempt at finer delineation belongs to study beyond the scope of the present one. It may be objected that the interpretative significance of these factors is, then, not comparable with such permutations of factors as the Rorschach Fc, cF, ChF, FCh, etc. It should be remembered, however, that Rorschach FCh and ChF are rooted in Ch, and there is great value to be expected from a localization of the main stem from which derivative branchings spring.

<sup>52</sup> Statements regarding Rorschach symbols and values are taken from summaries by Hertz (41) of the most popular interpretations in clinical use.



(2) *Distance, perspective, tri-dimensionality*: Tentative effort at sensory expansion. Has characteristic of attempting tentative form break from sensory while still retaining sensory data. Clearness appears to be assigned foreground positions. Indistinction will also elicit. May be related to figure-ground articulations, and, at clear focus, to discrepancies between expectancy built up and present revelation.

Low-grade and elemental conciliatory agent; appears predominantly protective.

F(C): response determined by the finely differentiated black and grey areas, where form and the light-dark values play a part (after Binder); also, distance, perspective, tri-dimensionality, depth.

Careful, cautious, guarded adaptation to environment; anxious, cautious attitudes. With *dysphoric* content: negative, sensitive, anxious kind of adaptation; with *euphoric* content: tender, delicate, emphatic adaptation (after Binder); reflects inner stirrings either as anxieties or introspective tendencies to dispel such anxieties, adjustment tendencies to oneself (after Klopfer).

#### Interpretation:

Perception framed in perspective or tri-dimensionality is only one step removed from the primitive sensory level. A subject who utilizes this technique is maintaining every possible protection and coverage in the first attempts at breaking with the sensory. In terms of the Rorschach, this factor appears a graduation toward the environment but highly cautious and still related to the anxieties and conflicts of the Ch level.

(3) *Surface quality*: "Feeler" element. First full-fledged attempt to break from sensory data but highly unstable because of lack of form assistance. Offered with great caution, and subsequently withdrawn and replaced many times.

Fc, cF, or c: tentatively accepted as response determined by surface texture (after Klopfer).

If Fc: sensitivity; cautious approach to happenings around one, resulting in shyness or tactfulness (after Klopfer). Adjustment tendency to outer world.

If cF, c: sensuality; desire for contact with surroundings (after Klopfer, Piotrowski).

#### Interpretation:

A subject cannot offer textural qualities in perception until some progress has been achieved toward an independent status. Perhaps here is the justification for Rorschach interpretations which depend on maturity and experience. Texture, however, is still an element of the transitory level, highly tentative, uncertain, and unstable. A subject relying upon such reports has not gained enough assurance in his separation from the stimulus to make permanent assignment of dominance and hence is forced to maintain protection by multiple possibilities. The Rorschach caution seems highly justified; sensuality as an interpretation is not so clear in the present data.

- (4) *Form*: Advanced level of performance, showing many degrees of progress. First expressed as "felt" rather than known, highly generalized and uniform; followed by trial-and-error sequence of grossly inaccurate guesses, quickly withdrawn and many others tried, until some satisfaction reached. Finally accepted form marks emergence of interpretative stage.
- F: response determined by shape alone. If +, sharply and accurately perceived; if —, poorly and inaccurately perceived.
- Conscious effort and control; voluntary control of intellectual functioning.
- If +: accuracy of form perception, hence accuracy in thinking; power of observation, precision, and definiteness in thinking, conscious attention to stimulus presented, hence capacity for concentration.

#### Interpretation:

Location of a form which is sufficiently satisfactory to warrant complete independence from the stimulus marks the acme of perceptual development. It is here that the constructs of interpretation begin. Form, therefore, represents a boundary point between the restrictions of the stimulus and environmental freedom for the organism. In terms of the Rorschach, there is complete agreement that this point represents the advent of voluntary manipulation by the subject.

- (5) *Human movement*: Is a constructive detail supplementary to tentative form already offered. Discovered where sensory data do not verify. Appears particularly prevalent where ready derivation of stable form is difficult. Appears also to evolve in sequence that proceeds from dead to animate.
- M: response determined by movement which is actually felt and experienced, including impending movement, strain, or tension. May be expressed in terms of displacement or passivity.
- Intra-psychic activity; activity of the inner life in the realm of the imagination or intuition; capacity for phantasy, creative, original ability; power of introversion.
- If confabulatory: impaired or deficient mental functioning, fabrication, pathology.

Indicates high level of development beyond the data.

#### Interpretation:

The evidence is no more than suggestive in the present case, and calls for further investigation. Apparently human movement cannot be achieved until the subject has advanced far enough to exceed the data completely. Not only has form been offered tentatively, but it is now *tried out* at the interpretative level by the use of constructive detail. If this is on the right track, then movement signifies an independent, self-stimulated operation by the subject in excess of the situation. The Rorschach interpretation of creative and imaginative inner life is at once apparent.

- (6) *Artificial movement*: Reports of "felt" movement seem probably significant here. Found at very low levels of perceptual development. Cues are smoothed and regular. Apparently never inter-changed with human movement. Suggests nature of subjective state.
- m: tentatively offered for inanimate movement, including movement of natural forms of artificial happenings.
- Underdevelopment or repression of the inner life (after Klopfer, Piotrowski, Booth). Inner turmoil, frustration, inner instability; checks and inhibitions, when internal conflict.

#### *Interpretation:*

The present data can do no more than suggest possibilities for further investigation. If these felt movements are distinct from the later, mature, developed, and objectified human movements, perhaps they represent an early subjectivity characteristic of the primitive levels. A much needed point of investigation is a determination if inanimate movements (in the present case, "whirlpools," for instance) occur only or most frequently in this phase. If so, there is direct application to the Rorschach interpretation of repression and lack of development.

- (7) *Color*: Struggle for form FC, CF, or C: response seems often to obscure color recognition, and vice versa. Is frequently reported before form is achieved.
- If FC: emotional adaptability, emotional rapport with the environment, adjustment to reality, emotional factors under control.

If CF: emotional lability, instability, excitability; egocentric or impulsive feelings; infantilism.

If C: uninhibited, impulsive, egocentric emotionality; lack of emotional control; highly primitive reaction, temper, explosive feelings.

#### *Interpretation:*

The present data have very little to offer for discussion here. There seems to be some relationship between form and color derivation. Color is obviously original sensory material. Does it differ from sensory blacks, whites, and greys, and does its use indicate that the subject is required, for some reason, to remain at the primitive sensory stage?



## CHAPTER VIII

### SUMMARY AND CONCLUSIONS

THIS investigation has sought to probe the larger problem of the order and regularity of all natural events as manifested in the limited area of perception. Previous studies had borne witness that perception is phenomenal in character. What, then, are the determinants beyond the stimulus factor? Have Gestaltists erred in undue emphasis on the nature of the influence at the sensory point? Trends in the biological and physical sciences are converting the approach to ordered events from static points to dynamic processes. What, then, is the nature of the progressive development of perception? Under what minimal conditions does meaningful experience enter the sequence, and what transitory phases precipitate that state?

Eighteen adult subjects participated in a series of individual experimental situations. Picture material of varied complexity was projected tachistoscopically at exposures of 2.5 ms (1/400 sec.) speed, proceeding through a graded series of focal steps from complete out-of-focus to clear in-focus. Subjects dictated into the Ediphone at each focal step a verbatim record of that perceptual experience, accumulating altogether a total of 958 protocols from which qualitative evaluations were subsequently deduced.

On the basis of the analysis of these protocol records, the following conclusions have been derived regarding the nature of perceptual phenomena:

(1) Perception is a process in time whose course spans an orderly sequence of developments and whose termination marks a formidable achievement of organization in which some parts have been elevated to dominance and others have been depressed to subordination. The

dynamic trend of this development is constructive in nature, in a direction always independent of the stimulating circumstances. Nothing is more characteristic of perception than the selective attitude to which sensory materials are submitted until a significance accrues exceeding that which the data alone would justify.

(2) The course of perceptual development is singularly uniform among all subjects and is reproduced with striking fidelity in every progression. Phases of the sequence are not always equivalent in length of time nor in intensity, but their order consistently approximates three degrees of transformation, that is, a beginning sensory stage, an intermediate exploratory stage, and a final interpretative stage. Earlier stages may reappear in later phases of the sequence, but only as reinstatement of protection when higher levels have become too daring.

(3) Most primitive and elementary level is the sensory stage, which is purely a descriptive treatment of the stimulating data. Sensory materials are expressed in terms of density (haziness, diffusion), intensity, location, size, direction of tendency, and counting. Geometric forms are sometimes introduced to specify the sensory character but remain essentially distinct from the meaningful forms of the later levels. Normally, sensory materials stimulate perceptual action and then diminish in potency. Their persistence into subsequent phases may indicate a reluctance against commitment to a totally new level, a lack of any more workable material, or a contribution for hierarchical integration.

(4) Broad and varied forms of trial-and-error behavior make debuts in the

exploratory stage, which is decidedly utilitarian in effecting a transition away from stimulus restrictions. The volume and intensity of activity here bespeak how turbulent is the evolution of perceptual experience out of sensory conditions. Tentative acts which emerge in an orderly gradation, from the extremes of slight restlessness with the stimulus to expanding boldness of manipulation, include:

(a) expressions of "feelings" of vague and indefinite potentialities and of tensions from lack of organization;

(b) aggressive efforts at comparative matching via analogies from nature of unbounded, unformed, and diffused sensory experiences; qualities of perspective and distance; qualities of texture without form; and a sequence of trial forms, from "felt" experiences to single and multiple shapes;

(c) secondary evidences of frustration when perceptual completion is not achieved, expressed in random hand and foot movements; language difficulties; rationalizations of lapse of memory and inaccurate fixation point; denunciations of speed of exposure; rejective evaluation of stimulus material; accusations of compulsory attention to figure portions away from groundal parts; antagonistic attitude toward lack of clarity in out-of-focus; objections to parts of the experimental procedure.

(5) The acme of perception is accomplished in the interpretative stage. An air of confidence testifies that sensory limits have at last yielded to the designs of the perceiver, which may often take the form of extravagant manipulation. The possibilities explored in the preceding transition have been discriminated among and a choice accepted, though that choice always extends beyond the provisions of the stimulus which instigated the exploratory trials. Any natural retention of the raw data at the interpretative phase is in the role of cue reduction, and even cues now become selectively sorted and

sifted out. By this level, meaning has been both admitted and assured.

(6) The natural sequence in the perceptual act is away from the initiating stimulus. A subject who reports wholly or partially in terms of raw data is assumed to be blocked for some reason against more advanced progression. When all other conditions are favorable to perceptual development, adherence to sensory materials implies conflict between antagonistic forces which prohibit organization into dominant and subordinate categories. This confirms the Rorschach shading (Ch) factor as an anxiety indicator, and locates its genesis at the most primitive level of perceptual performance.

(7) Reports framed in perspective or tri-dimensionality rely either on sensory data alone or combine both raw sensory material and exploratory form. The subject utilizing this technique is preserving the most protective coverage possible in the first attempts away from the stimulus. This confirms the Rorschach vista (F(C)) factor as an indicator of caution and guardedness but localizes it as a conciliator near the anxiety level, of a far lower order than the texture (c) factor.

(8) Reports of textural or surface qualities are the first aggressive efforts to exceed the stimulus restrictions. They are formless, however, and therefore temporary and unstable, subject to multiple withdrawals and replacement. A subject relying on such transitory qualities lacks sufficient assurance in separation from the stimulus to make assignment of dominant form and is forced to maintain protection with multiple possibilities of escape. This confirms the Rorschach texture (c) factor as an indicator of caution and locates its genesis in the exploratory phase of perceptual development, par-

tially advanced toward an independent status. No evidence is found for an interpretation as a sensuality indicator.

(9) Satisfactory form assignment closes the transitory phase and admits the interpretative level, thereby representing the real goal of perceptual development. Such assignment, however, is to be distinguished from the temporary forms tried out in sequence at the exploratory level. Form manifests achievement by the organism of dominance over stimulus restrictions, confirming the Rorschach form (F) factor as a high level perceptual attainment and an indicator of voluntary intellectual activity. Justification of the Rorschach + or - qualification is inherent in the goodness of the form with which the organism is satisfied to close the developmental struggle.

(10) Substantial indications worth pursuit suggest that human movement is a detail of an interpretative order, self-stimulated in excess of the sensory facts. If correct, this confirms the Rorschach human movement (M) factor as an indicator of creative and imaginative inner play and places it as a high level perceptual attainment.

(11) Figure and ground are here defined as units of sensory data, contrasting sufficiently in light intensity to constitute separate forces. Their separation marks progress on a transitional scale essential to the ultimate achievement of form, but they are probably not the primary perceptual experiences which the Gestaltists have maintained. Much preliminary transitional effort precedes their derivation, and a great deal more struggle may succeed before form can be stabilized and meaning admitted. The figure-ground phenomenon is, therefore, not an original state but a progressive integration of complex perceptual forces.

(12) Meaning unfolds as an abstract description of a relative state of equilibrium between the organism and its environment. The sequence of perception is a design for exploration, and meaning is its consummation. When the struggles of transition have satisfied a serviceable condition for the organism and the license to interpretative freedom has been granted, there meaning has its threshold. Hence not even form nor figure-ground articulation is guarantee that meaning will be completed unless antagonistic forces can be resolved and some dominance eventually stabilized.

(13) The determinants of perception are functions of dynamic phases, and the criterion of perceptual development is an operational scale of emergences. Success in perceptual reorganization, therefore, requires attack on the natural active motor setting of the field arrangement which structures the quality and order of the emergences. Orientation of clinical therapy in terms of such a viewpoint would transpose the goal of *adjustment* to *processes of adjusting* and would encourage applications of aggressive restructuring techniques in the interval of the transitional struggle.

(14) There is good reason to object to the Gestalt emphasis on objective conditions as primordial organizers in perception. Though there is no contesting that stabilization climaxes perceptual activity, attention shifts, in explaining stability, from external conditions to the need of the organism for a state of balance with its environment. In such a viewpoint, sensory stimuli spell potential threat of destruction and are forced to succumb to retaliating motor adjustments which underlie the entire process of perceptual development. Stabilization, therefore, is a product of the approxima-



tions and corrections of the returning backstroke fused with the residuals of previous backstrokes, and the fating of the course of perception is conceded to be set even before the stimulus occurs.

(15) The out-of-focus to in-focus methodology, particularly when coupled with tachistoscopic projection, proves highly fruitful for an exploration of the perceptual process. An exposure speed of 2.5 ms is entirely adequate for perceptual purposes and is sufficient to demonstrate the fact that perception involves vastly more than vision alone. Graduated focal points have the advantage over mere changes of illumination that they bring new sensory data at each step and thereby force an original attack at each point of report, displaying at every setting the conditions which give rise to a developmental phase.

#### IMPLICATIONS FOR FURTHER INVESTIGATION

We have already indicated that this study does not satisfy a genetic explanation for all of the Rorschach factors. Those which it does clearly demonstrate suggest that others might also be discovered with experimental means more conducive to their exposure. Human movement as an interpretative detail needs more examination, particularly in relation to tendencies of progression from inanimate to animate states. Color suggests itself by hypothesis to be of sensory character. Why, then, is its diagnostic value for the Rorschach as an indicator of external adjustments, and not the same as the intrinsic quality of the shading factor? Are form and color mutually exclusive? The possibility of relationship between artificial or natural movement and the more developed hu-

man movement warrants study beyond the present one. Are inanimate movements as found here concurrent with early and primitive phases of perception, and how much of their presence is blatant reflection of motor components induced by the smoothness of forms in early focal steps? Very few of the present materials elicited responses of animal movement, though these might well be stimulated by more specialized selection of slides.

So many advantages adhere to the out-of-focus to in-focus methodology that it deserves examination as a potential new projective technique. The fact that some of the slides in the current study brought identical, in spite of inaccurate, reports at specific out-of-focus points suggests strongly that the whole experimental design, with some modifications, might lend itself to eventual standardization as a projective method. In conjunction with tachistoscopic exposures on a mm scale of progression, a system might even prove feasible for grading responses on a quantitative basis.

The significant findings for adult subjects justify a repetition of the entire study, appropriately modified, with juvenile subjects of a variety of age representations. If the perception of adults is characteristically disjunctive, while that of children is coherent, where, in the developmental sequence, have the emphases been altered? And in the light of the needs of the organism, what function do these changes come to serve?

At this point we take departure in full assurance that the future will not soon impoverish perception of its rich stores of experimental materials—at least, not for the student who is curious still about this most momentous of all phenomena.

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Let  $y$  be a function of  $x$  which satisfies the differential equation

$$y' + P(x)y = Q(x).$$

Then the function  $y$  can be written in the form

$$y = e^{-\int P(x) dx} \left( \int Q(x) e^{\int P(x) dx} dx + C \right),$$

where  $C$  is an arbitrary constant. This is the general solution of the differential equation.

Let us now consider the case in which  $P(x)$  and  $Q(x)$  are both functions of  $x$ .

Let  $y_1$  be a particular solution of the differential equation

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Let  $y_4$  be a particular solution of the differential equation

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